FCC TEST REPORT

FCC ID:2AQURZW30S

Product Name	:	In-Wall Smart Switch
Model Name	:	ZW30S,ZW30TS,MS10ZS,MS12ZS
Brand Name	:	N/A
Report No.	:	PTC20092201701E-FC01

Prepared for

NIE-TECH CO., LTD

Jinlian commercial center 9001, Jinxiu road No.2, Changan Town,Dongguan City, Guangdong Province, China

Prepared by

Precise Testing & Certification Co., Ltd.

Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

1 TEST RESULT CERTIFICATION

Applicant's name	:	NIE-TECH CO., LTD
Address	:	Jinlian commercial center 9001, Jinxiu road No.2, Changan Town,Dongguan City, Guangdong Province, China
Manufacture's name	:	NIE-TECH CO., LTD
Address	:	Jinlian commercial center 9001, Jinxiu road No.2, Changan Town,Dongguan City, Guangdong Province, China
Product name	:	In-Wall Smart Switch
Model name	:	ZW30S,ZW30TS,MS10ZS,MS12ZS
Standards	:	FCC Part15 Subpart C, Paragraph 15.249
Test procedure	:	ANSI C63.10: 2013
Test Date	:	Sep. 24, 2020 to Oct. 12, 2020
Date of Issue	:	Oct. 12, 2020
Test Result	:	Pass

This device described above has been tested by PTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.
This report shall not be reproduced except in full, without the written approval of PTC, this document may be altered or revised by PTC, personal only, and shall be noted in the revision of the document.

Test Engineer:

Leo Yang / Engineer

Technical Manager:

Chris Du / Manager

Contents

2 Test Summary

Standard Section	Test Item	Result
15.203	Antenna Requirement	PASS
15.207	Conducted Emission	PASS
15.249	Radiated Emission	PASS
15.215(c)	20dB Bandwidth	PASS
Remark: “N/A” is an abbreviation for Not Applicable.		

3 TEST FACILITY

Precise Testing & Certification Co., Ltd.

Address: Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

FCC Registration Number: 790290

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A-1

4 General Information

4.1 General Description of E.U.T.

Product Name	:	In-Wall Smart Switch
Model Name	:	ZW30S,ZW30TS,MS10ZS,MS12ZS Note:The exterior color is different, the others are the same, choose ZW30S as the main test model
Bluetooth Version	:	N/A
Operating frequency	:	908.4Mhz
Numbers of Channel	:	1 Channels
Antenna Type	:	Internal Antenna
Antenna Gain	:	1 dBi
Type of Modulation	:	GFSK
Power supply	:	Input: AC 120V 60HZ
Hardware Version	:	N/A
Software Version	:	N/A

4.2 Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	CH01

For Conducted Emission	
Final Test Mode	Description
Mode 1	CH01

For Radiated Emission	
Final Test Mode	Description
Mode 1	CH01

Note:

1. The engineering test program was provided and the EUT was programmed to be in continuously transmitting mode.

4.3 List of Channels

Channel	Frequency (MHz)
01	908.40

5 Equipment During Test

5.1 Equipments List

RF Conducted Test

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
MXG Signal Analyzer	Agilent	N9020A	SER MY5111038	10Hz-30GHz	Aug. 21, 2021
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	Aug. 21, 2021
Power Meter	Anritsu	ML2495A	0949003	300MHz-40GHz	Aug. 21, 2021
Power Sensor	Anritsu	MA2411B	0917017	300MHz-40GHz	Aug. 21, 2021

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Radiated Emissions

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Aug. 21, 2021
Loop Antenna	Schwarzbeck	FMZB 1519	012	9 KHz -30MHz	Aug. 21, 2021
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	25MHz-2GHz	Aug. 21, 2021
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	1MHz-1GHz	Aug. 21, 2021
Cable	Schwarzbeck	PLF-100	549489	9KHz-3GHz	Aug. 21, 2021
Spectrum Analyzer	Agilent	E4407B	MY45109572	9KHz-40GHz	Aug. 21, 2021
Horn Antenna	SCHWARZBECK	9120D	9120D-1246	1GHz-18GHz	Aug. 21, 2021
Power Amplifier	LUNAR EM	LNA1G18-40	J10100000081	1GHz-26.5GHz	Aug. 21, 2021
Horn Antenna	SCHWARZBECK	BBHA 9170	9170-181	14GHz-40GHz	Aug. 21, 2021
Amplifier	SCHWARZBECK	BBV 9721	9721-205	18GHz-40GHz	Aug. 21, 2021
Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	Aug. 21, 2021

RF Cable	R&S	R204	R21X	1GHz-40GHz	Aug. 21, 2021

Conducted Emissions

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Aug. 19, 2021
Artificial Mains Network	Rohde&Schwarz	ENV216	102453	9KHz-300MHz	Aug. 19, 2021
Artificial Mains Network	Rohde&Schwarz	ENV216	101342	9KHz-300MHz	Aug. 19, 2021

5.2 Measurement Uncertainty

Radiation Uncertainty	:	Ur = 3.9 dB (Horizontal)
		Ur = 3.8 dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4 dB

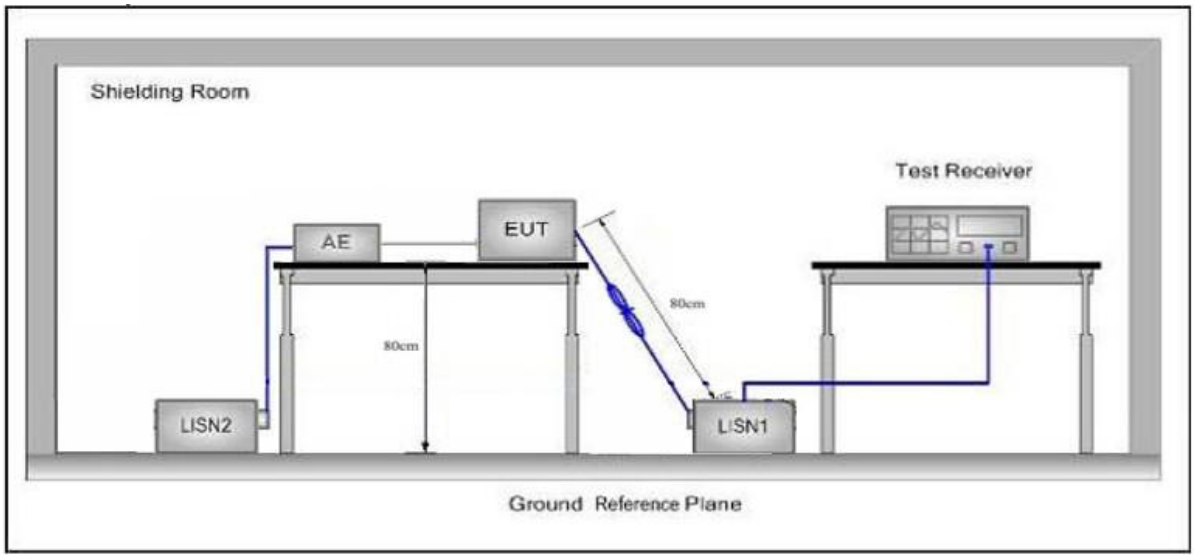
5.3 Description of Support Units

Equipment	Model No.	Series No.
light	Input:AC120V,60Hz Output:AC120V 16A	N/A

6 Test Standard and Limit

Test Standard	FCC Part15 Section 15.207		
Test Limit	Frequency	Maximum RF Line Voltage (dBuV)	
		Quasi-peak Level	Average Level
	150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
	500kHz~5MHz	56	46
	5MHz~30MHz	60	50
Remark: (1) *Decreasing linearly with logarithm of the frequency. (2) The lower limit shall apply at the transition frequency.			

6.1. Test Setup



6.2. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.10-2013 on Conducted Emission Measurement.

The bandwidth of test iSurpass Smart Gateway (ESCI) set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

6.3. Test Data

PASS

During the test, pre-scan all the modes, and found the CH 01 channel which is the worst case, only the worst case is recorded in the report.

Conducted Emission Test Data

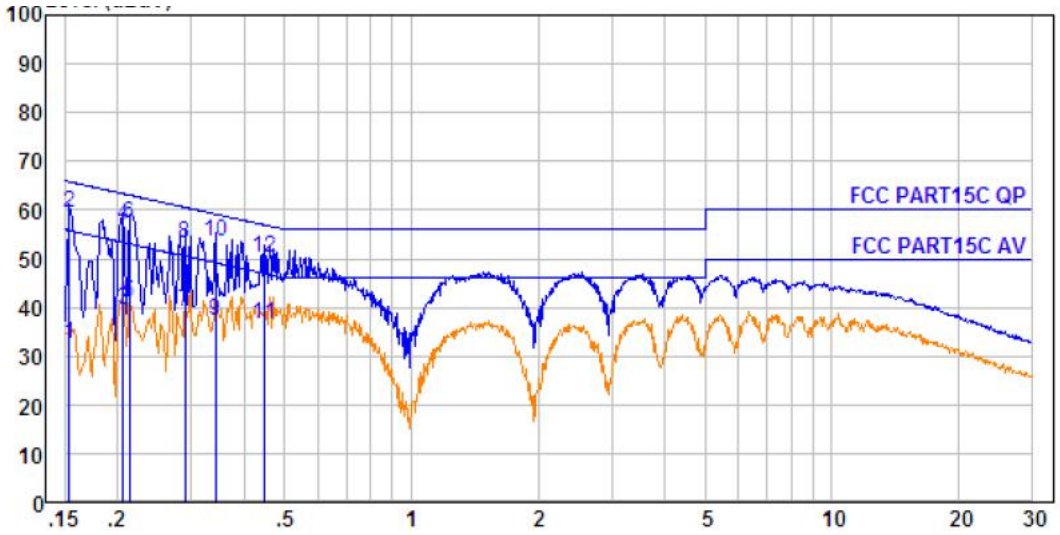
Test Site: 1# Shielded Room

Operating Condition: CH 01

Test Specification: AC 120V

Comment: Live Line

Tem.: 23.6℃ Hum.: 58%



No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.154	0.21	9.59	22.63	32.43	55.78	-23.35	Average
2.	0.154	0.21	9.59	49.72	59.52	65.78	-6.26	QP
3.	0.206	0.29	9.59	29.60	39.48	53.36	-13.88	Average
4.	0.206	0.29	9.59	46.86	56.74	63.36	-6.62	QP
5.	0.214	0.29	9.59	31.24	41.12	53.05	-11.93	Average
6.	0.214	0.29	9.59	47.15	57.03	63.05	-6.02	QP
7.	0.289	0.36	9.60	28.97	38.93	50.54	-11.61	Average
8.	0.289	0.36	9.60	43.35	53.31	60.54	-7.23	QP
9.	0.343	0.39	9.60	27.22	37.21	49.13	-11.92	Average
10.	0.343	0.39	9.60	43.35	53.34	59.13	-5.79	QP
11.	0.449	0.42	9.61	26.64	36.67	46.89	-10.22	Average
12.	0.449	0.42	9.61	40.07	50.10	56.89	-6.79	QP

Conducted Emission Test Data

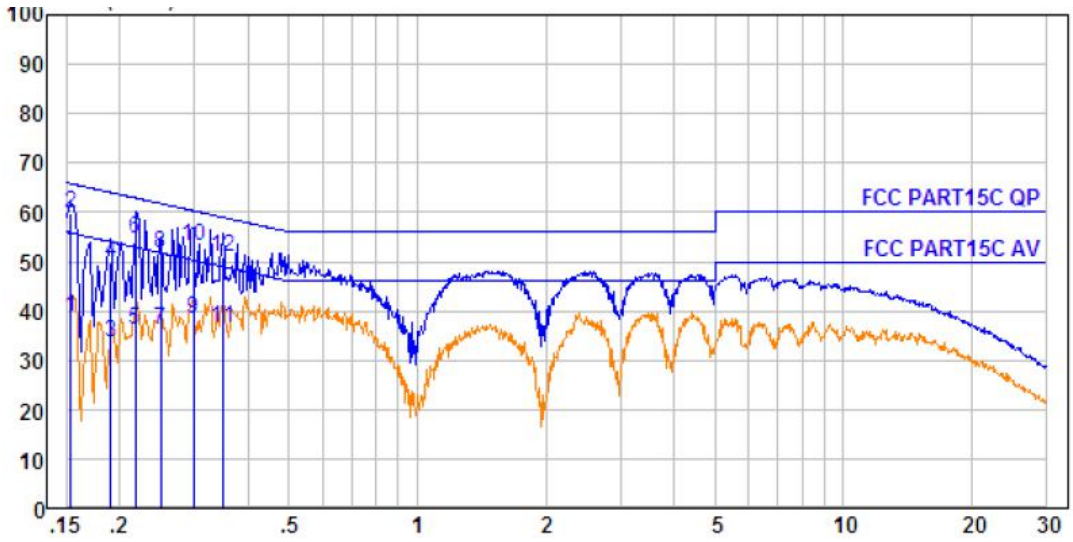
Test Site: 1# Shielded Room

Operating Condition: CH 01

Test Specification: AC 120V

Comment: Neutral Line

Tem.: 23.6℃ Hum.: 58%



No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.154	0.21	9.60	29.00	38.81	55.78	-16.97	Average
2.	0.154	0.21	9.60	49.97	59.78	65.78	-6.00	QP
3.	0.190	0.27	9.61	23.58	33.46	54.02	-20.56	Average
4.	0.190	0.27	9.61	39.95	49.83	64.02	-14.19	QP
5.	0.218	0.30	9.61	26.40	36.31	52.89	-16.58	Average
6.	0.218	0.30	9.61	44.80	54.71	62.89	-8.18	QP
7.	0.249	0.33	9.61	26.06	36.00	51.78	-15.78	Average
8.	0.249	0.33	9.61	41.70	51.64	61.78	-10.14	QP
9.	0.298	0.37	9.62	28.50	38.49	50.30	-11.81	Average
10.	0.298	0.37	9.62	43.20	53.19	60.30	-7.11	QP
11.	0.350	0.39	9.62	26.66	36.67	48.96	-12.29	Average
12.	0.350	0.39	9.62	40.79	50.80	58.96	-8.16	QP

7 . Radiated Emission and Band Edge

7.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.209 and 15.205				
Test Limit	Frequency (MHz)	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz~0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz~88MHz	100	40.0	Quasi-peak	3
	88MHz~216MHz	150	43.5	Quasi-peak	3
	216MHz~960MHz	200	46.0	Quasi-peak	3
	960MHz~1000MHz	500	54.0	Quasi-peak	3
	Above 1000MHz	500	54.0	Average	3
		-	74.0	Peak	3

Remark:

(1)The lower limit shall apply at the transition frequency.

(2) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Test Standard	FCC Part15 C Section 15.249					
Test Limit	Frequency (MHz)	Field Strength of fundamental ((millivolts /meter)	Field Strength of Harmonics (microvolts/meter	Limit (dBuV/m)	Remark	Measurement distance (m)
	902~908	50	-	94.0	Quasi-peak	3
		-	-	-	-	-

Remark:

(1) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

7.2. Test Setup

Figure 1. Below 30MHz

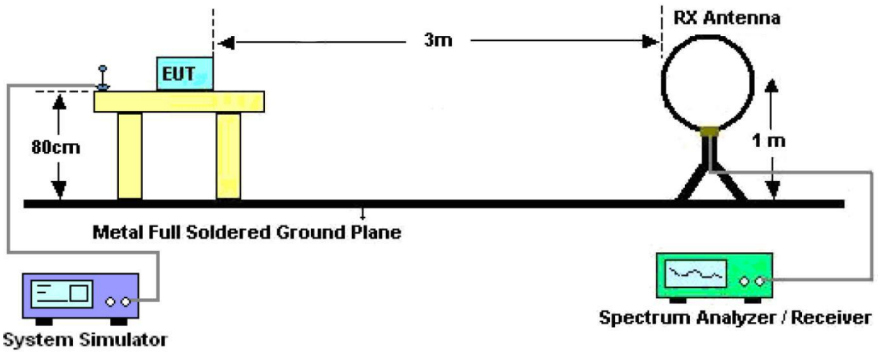


Figure 2. 30MHz to 1GHz

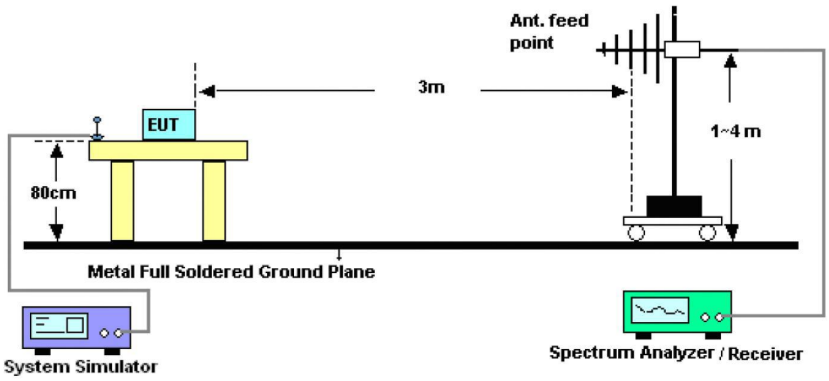
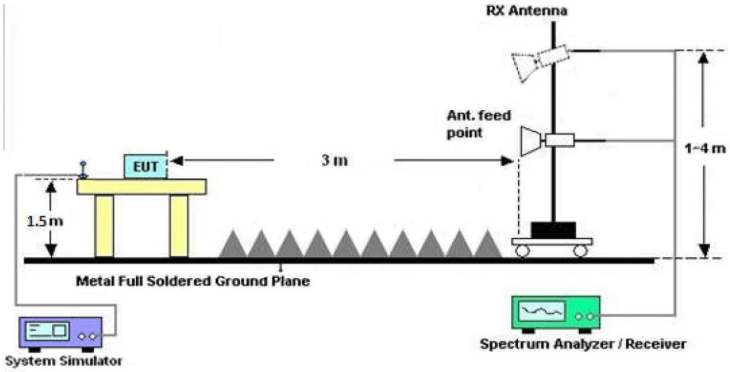


Figure 3. Above 1 GHz



7.3. 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. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

For 9kHz to 150kHz, Set the spectrum analyzer as:

RBW = 200Hz, VBW =1kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:

RBW = 9KHz, VBW =30kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 30MHz to 1000MHz, Set the spectrum analyzer as:

RBW = 100kHz, VBW =300kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

.

For above 1GHz,Set the spectrum analyzer as:

RBW =1MHz, VBW =1MHz, Detector= Peak, Trace mode= Max hold, Sweep- auto couple.

RBW =1MHz, VBW =10Hz, Detector= Average, Trace mode= Max hold, Sweep- auto couple.

7.4. Test Data

PASS

During the test, Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the X-axis is the worst case.

The test results of 9kHz-30MHz was attenuated more than 20dB below the permissible limits, so the results don't record in the report.

During the test, pre-scan all the modes, and found the CH 01 channel which is the worst case, only the worst case is recorded in the report

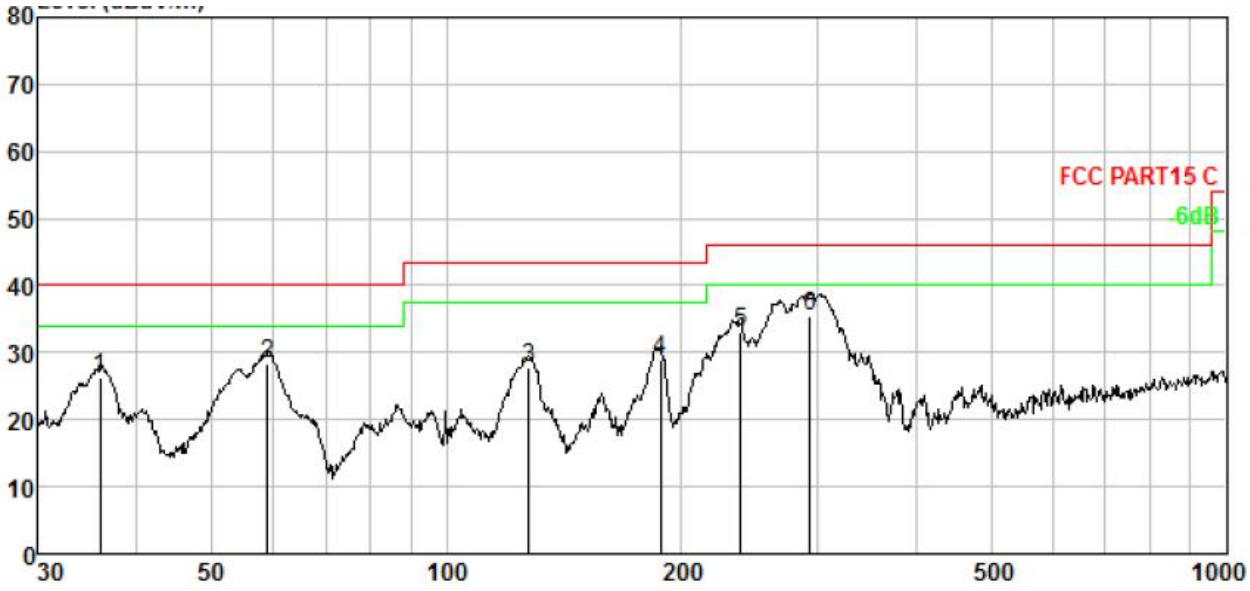
Test Results (30~1000MHz)

Test Mode: CH01

Power Source: AC 120V

Polarization: Vertical

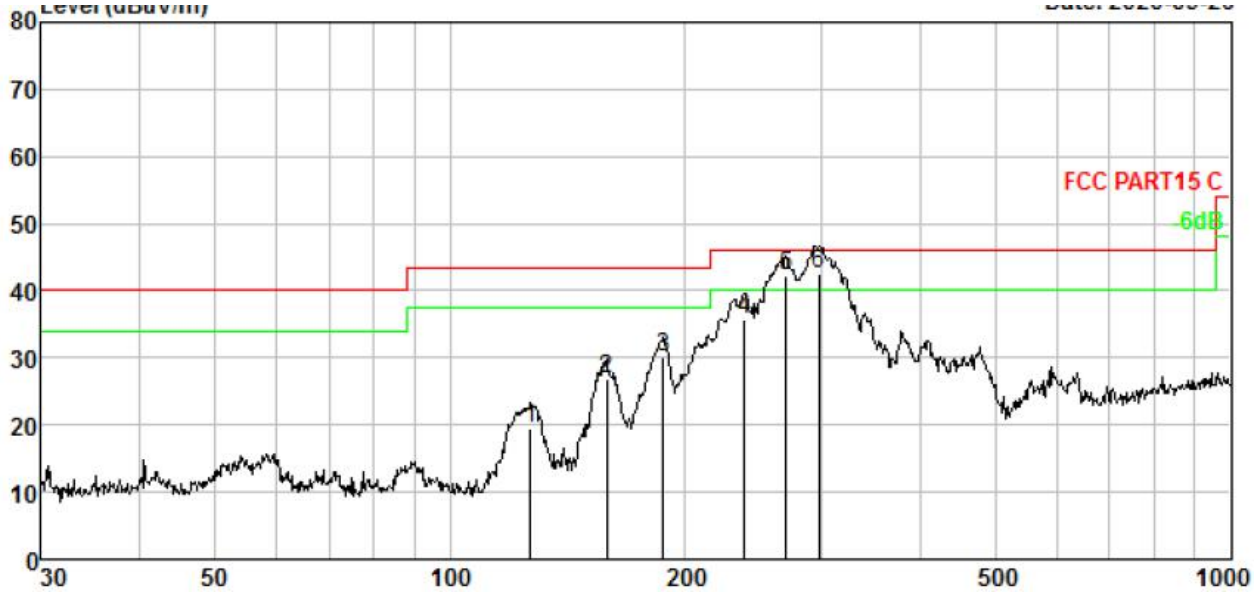
Temp.(℃)/Hum.(%RH): 24.5℃/52%RH



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	36.001	1.52	12.18	42.47	29.90	26.27	40.00	-13.73	QP
2.	59.025	2.36	11.78	44.09	29.94	28.29	40.00	-11.71	QP
3.	127.665	3.69	12.52	41.45	30.01	27.65	43.50	-15.85	QP
4.	188.413	4.36	11.85	42.78	30.04	28.95	43.50	-14.55	QP
5.	238.310	4.76	12.18	46.41	30.16	33.19	46.00	-12.81	QP
6.	293.084	5.12	13.11	47.60	30.30	35.53	46.00	-10.47	QP

Test Results (30~1000MHz)

Test Mode:	CH01
Power Source:	AC 120V
Polarization:	Horizontal
Temp.(℃)/Hum.(%RH):	24.5℃/52%RH



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	126.772	3.68	12.46	33.27	30.01	19.40	43.50	-24.10	QP
2.	158.668	4.07	14.05	38.76	30.02	26.86	43.50	-16.64	QP
3.	187.753	4.35	11.90	43.98	30.04	30.19	43.50	-13.31	QP
4.	238.310	4.76	12.18	48.87	30.16	35.65	46.00	-10.35	QP
5.	269.428	4.97	12.79	54.67	30.25	42.18	46.00	-3.82	QP
6.	297.224	5.14	13.16	54.62	30.31	42.61	46.00	-3.39	QP

Test Frequency 1GHz-10GHz

Frequency	Antenna	Reading	Cable Loss	Ant Factor	Amplifier	Level	Limits	Margin	Det.
(MHz)	Pol.	(dBuV/m)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Mode
1816.8	H	36.26	34.04	6.58	34.09	42.79	74.00	-31.21	PK
1816.8	H	31.14	37.11	7.73	34.50	41.48	54.00	-12.52	AV
2725.2	H	37.85	39.31	9.23	34.79	51.60	74.00	-22.40	PK
2725.2	H	32.33	34.04	6.58	34.09	38.86	54.00	-15.14	AV
1816.8	V	32.80	37.11	7.73	34.50	43.14	74.00	-30.86	PK
1816.8	V	30.18	39.31	9.23	34.79	43.93	54.00	-10.07	AV
2725.2	V	42.11	40.31	10.23	35.79	56.86	75.00	-18.14	PK
2725.2	V	32.40	41.31	11.23	36.79	48.15	54.00	-5.85	AV

Fundamental

Frequency	Antenna	Reading	Factor	Results	Limits	Det.
(MHz)	Pol.	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	Mode
908.4	H	26.03	3.01	29.04	94	QP
908.4	V	25.32	3.01	28.33	94	QP

Note: 1. The testing has been conformed to 10*908.4MHz=9084MHz.

2. All other emissions more than 30dB below the limit.

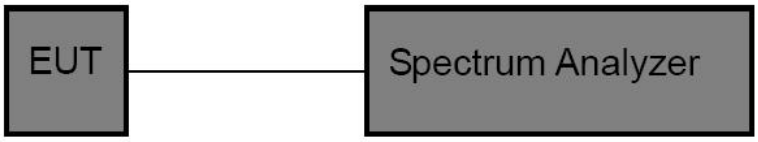
3. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Emission Level = Reading + Factor
Margin=Emission Level-Limit

8. 20dB Bandwidth Test

8.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.249

8.2. Test Setup



8.3. Test Procedure

1. Place the EUT on the table and set it in the transmitting mode.

2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

3. Set the spectrum analyzer as:

RBW = 30kHz, VBW≥3*RBW =100kHz,

Detector= Average

Trace mode= Max hold.

Sweep- auto couple.

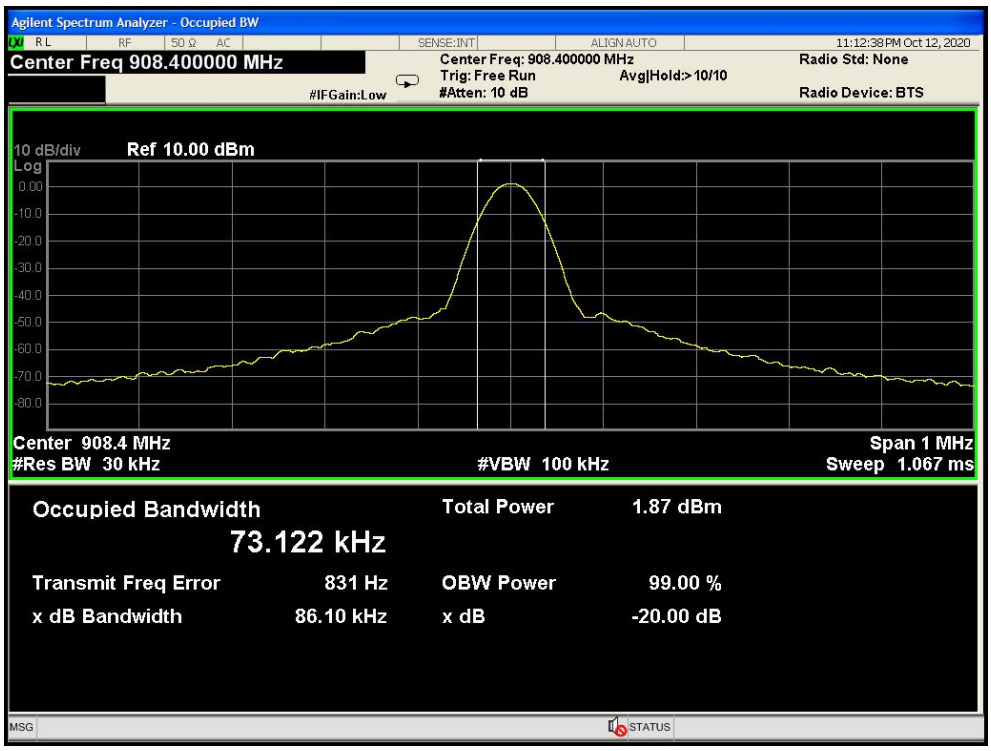
4. Mark the peak frequency and –20dB (upper and lower) frequency.

5. Repeat until all the rest channels are investigated.

8.4. Test Data

Test Item	:	20dB Bandwidth	Test Mode	:	Mode 1
Test Voltage	:	AC 120V	Temperature	:	22.4℃
Test Result	:	PASS	Humidity	:	55%RH

Test Modulation	Frequency (MHz)	Bandwidth (kHz)	Result
GFSK	908.4MHz	86.10	PASS



Test Mode: Low

9. Antenna Requirement

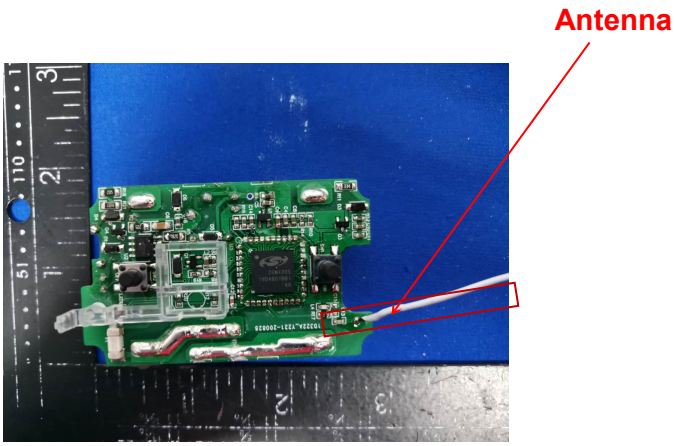
9.1. Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203
Requirement	1) 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.

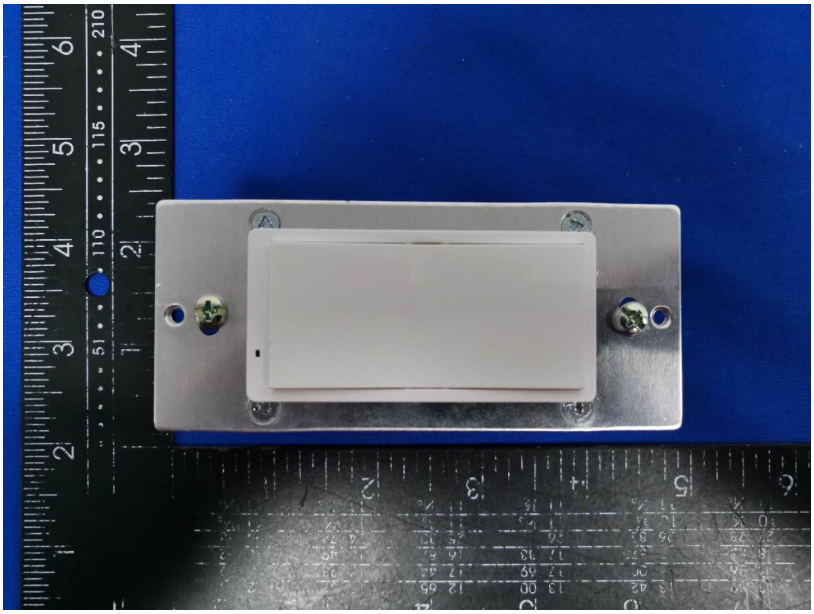
9.2. Antenna Connected Construction

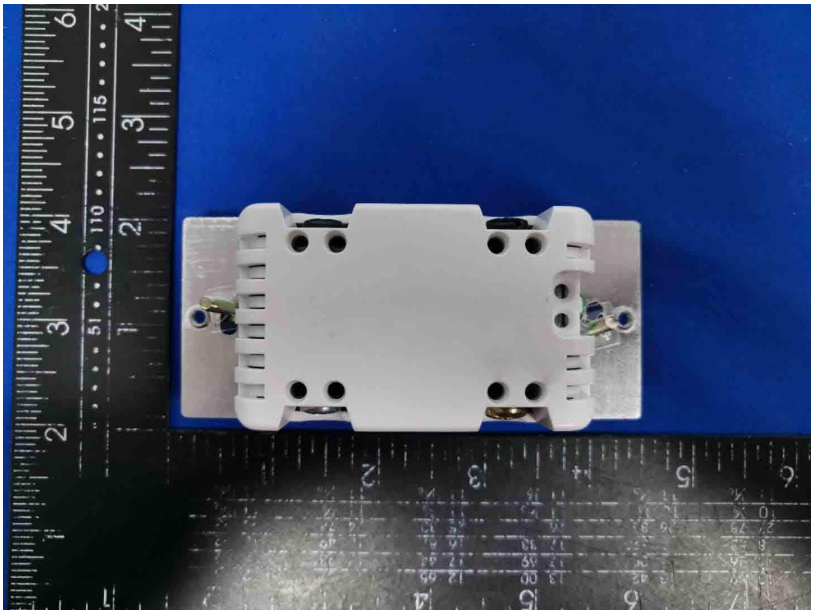
The antenna is a internal Antenna which permanently attached, and the best case gain of the antenna is

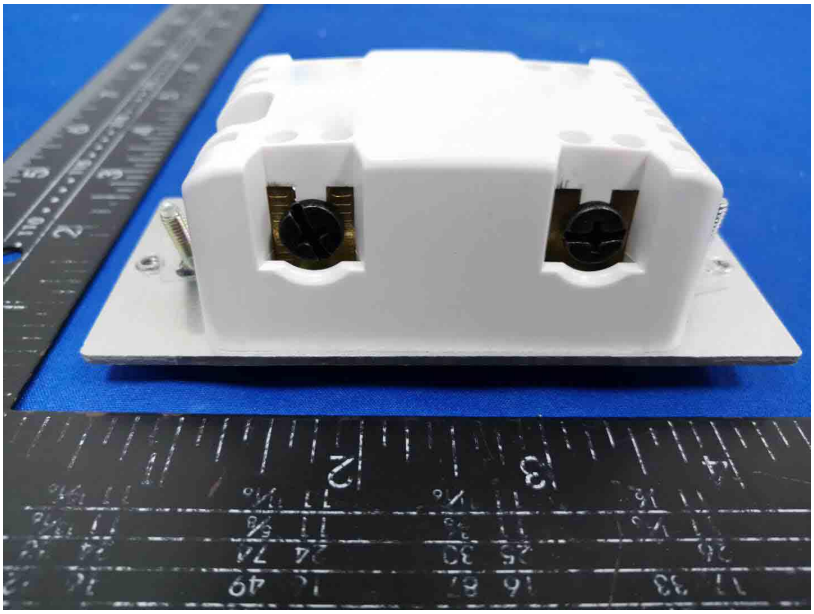
1 dBi. It complies with the standard requirement.

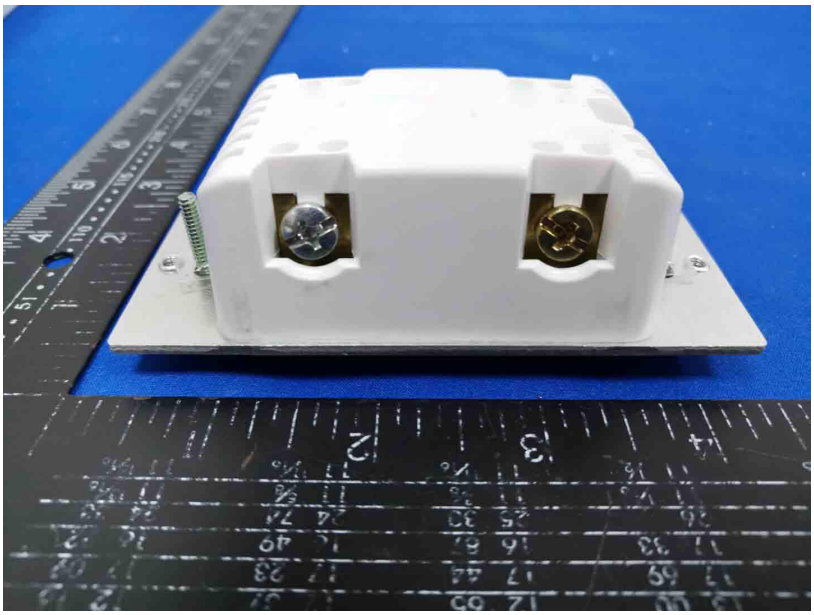


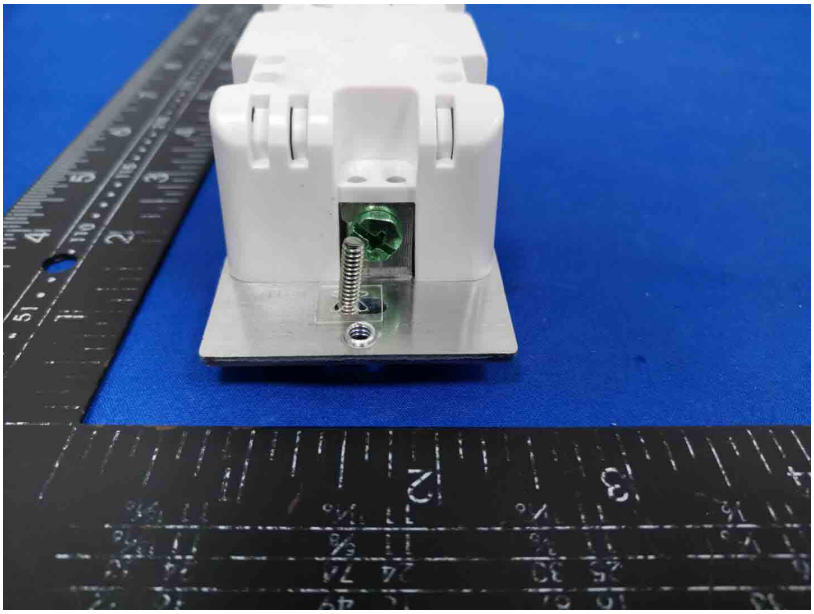
10 APPENDIX I -- PHOTOGRAPH

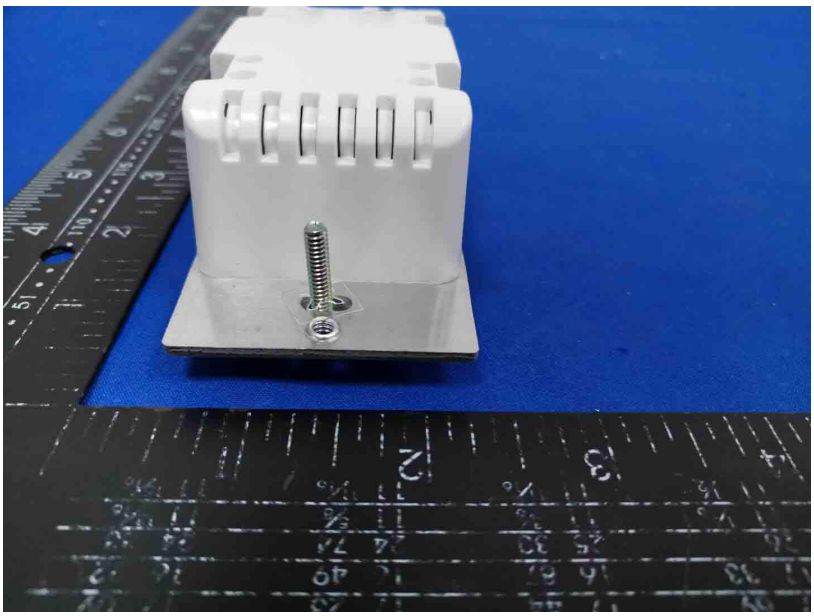


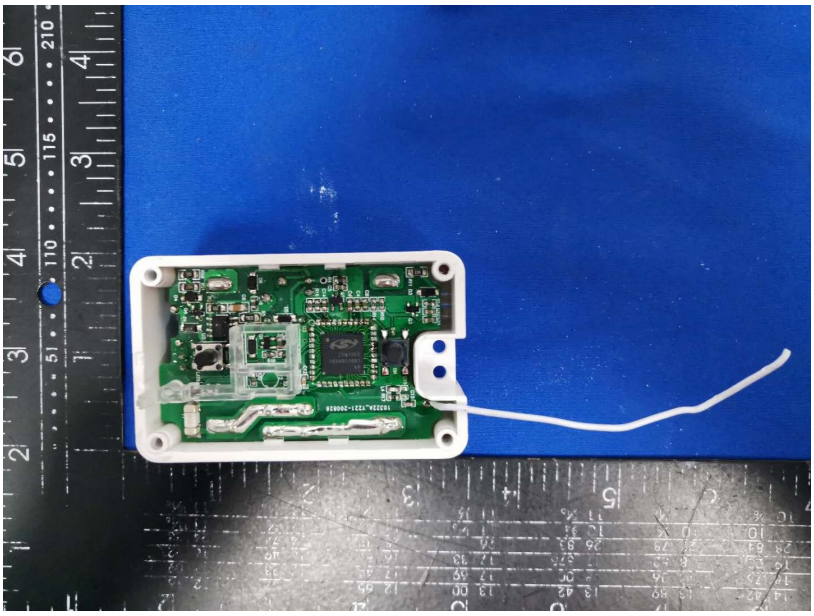


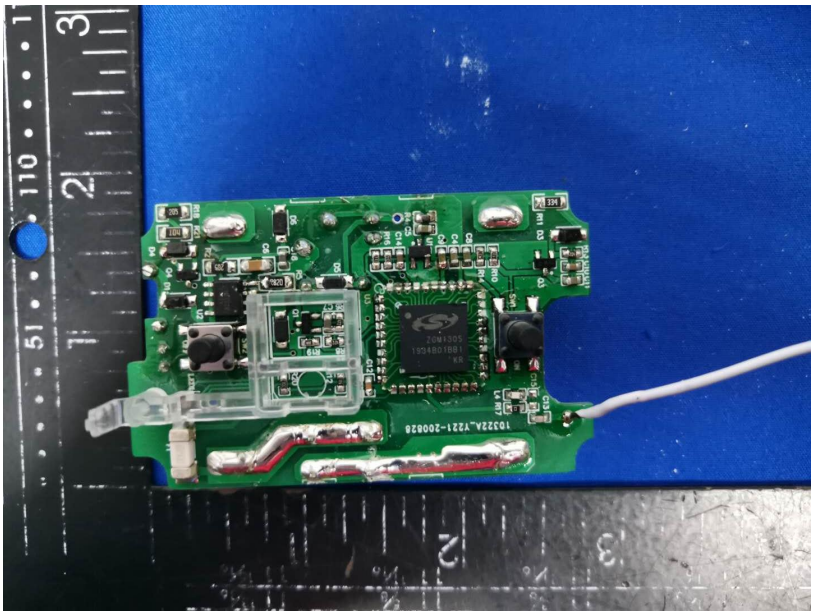


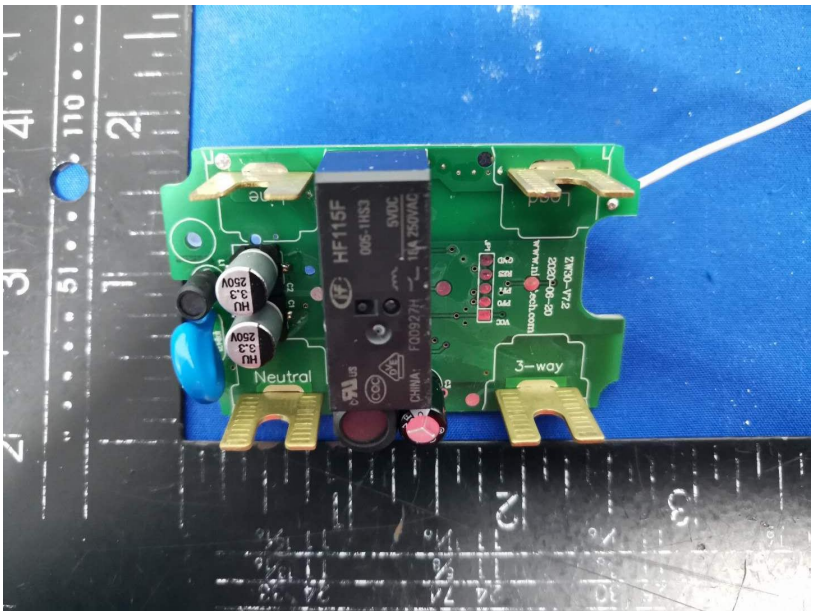












---------- End of Report ----------