



PRECISE TESTING

FCC TEST REPORT

FCC ID: 2AQRZW303

Product : Smart Switch
Model Name : ZW303
Brand : N/A
Report No. : PTC18080610901E-FC01

Prepared for

NIE Technology Co., Ltd

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

Prepared by

Dongguan Precise Testing & Certification Corp., Ltd.

Building D, Baoding Technology Park, Guangming Road 2, Guangming Community, Dongcheng District, Dongguan, Guangdong, China



1 TEST RESULT CERTIFICATION

Applicant's name : NIE Technology Co., Ltd
Address : Jilian commercial center 9001, Jinxiu road No.2, Changan Town, Dongguan City, GuangDong Province, China
Manufacture's name : NIE Technology Co., Ltd
Address : Jilian commercial center 9001, Jinxiu road No.2, Changan Town, Dongguan City, GuangDong Province, China
Product name : Smart Switch
Model name : ZW303
Standards : FCC CFR47 Part 15 Section 15.231
Test procedure : ANSI C63.10:2013
Test Date : August 07, 2018 to August 10, 2018
Date of Issue : August 13, 2018
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.

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Test Engineer:

Handwritten signature of Leo Yang in black ink.

Leo Yang / Engineer

Technical Manager:

Handwritten signature of Chris Du in black ink.

Chris Du / Manager



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2 Test Summary

Test Items	Test Requirement	Result
Conducted Emissions	15.207	PASS
Radiated Emission	15.231(a) 15.209 15.205(a)	PASS
Occupied Bandwidth	15.231(a) 15.205 15.209	PASS
Transmitter Timeout	15:215(c) 15.231	PASS
Antenna Requirement	15.203	PASS
Remark: N/A: Not Applicable		



3 General Information

3.1 General Description of E.U.T.

Product Name	:	Smart Switch
Model Name	:	ZW303
Operation Frequency:	:	908.42MHz
Antenna installation:	:	Integrated Antenna
Antenna Gain:	:	0dBi
Type of Modulation	:	ASK
Hardware Version	:	N/A
Software Version	:	N/A
Power supply	:	AC 120V/60Hz



3.2 Test Mode

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning testing based 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 or test configuration mode mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	TX

For Conducted Emission	
Final Test Mode	Description
Mode 1	TX

For Radiated Emission	
Final Test Mode	Description
Mode 1	TX



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3.3 Test Site

Dongguan Precise Testing & Certification Corp., Ltd.

Address: Building D, Baoding Technology Park, Guangming Road2, Dongcheng District, Dongguan,
Guangdong, China

FCC Registration Number: 790290

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A-1



4 Equipment During Test

4.1 Equipments List

RF Conducted Test

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
MXG Signal Analyzer	Agilent	N9020A	MY56070279	10Hz-30GHz	Apr 07, 2019
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	Oct 09, 2018
Antenna Connector	Florida RF Labs	N/A	RF01#	N/A	Aug. 26, 2018

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(Test Frequency from 9KHz-18GHz)

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Sep. 03, 2018
Loop Antenna	Schwarzbeck	FMZB 1519	012	9 KHz -30MHz	Aug 31, 2018
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	25MHz-2GHz	Aug 31, 2018
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	1MHz-1GHz	Sep. 03, 2018
Cable	Schwarzbeck	PLF-100	549489	9KHz-3GHz	Sep. 03, 2018
Spectrum Analyzer	Agilent	E4407B	MY45109572	9KHz-40GHz	Oct. 13, 2018
Horn Antenna	SCHWARZBECK	9120D	9120D-1246	1GHz-18GHz	Aug. 31, 2018
Power Amplifier	LUNAR EM	LNA1G18-40	J10100000081	1GHz-26.5GHz	Aug. 31, 2018
Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	Sep. 03, 2018



Conducted Emissions

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Sep. 03, 2018
Artificial Mains Network	Rohde&Schwarz	L2-16B	000WX31025	9KHz-300MHz	Sep. 03, 2018
Artificial Mains Network	Rohde&Schwarz	ENV216	101342	9KHz-300MHz	Sep. 03, 2018



4.2 Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	± 1 x 10 ⁻⁶
Bandwidth	± 1.5 x 10 ⁻⁶
Time	±2%
Duty Cycle	±2%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions (150kHz~30MHz)	±3.64dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB



5 Conducted Emission

- Test Requirement: : FCC CFR 47 Part 15 Section 15.207
- Test Method: : ANSI C63.10:2013
- Test Result: : PASS
- Frequency Range: : 150kHz to 30MHz
- Class/Severity: : Class B
- Detector: : Peak for pre-scan (9kHz Resolution Bandwidth)

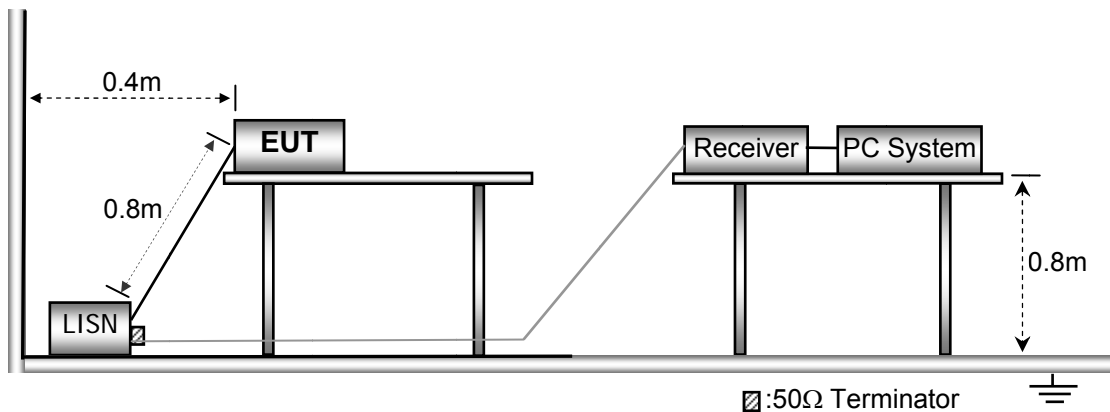
5.1 E.U.T. Operation

Operating Environment :

- Temperature: : 25.5 °C
- Humidity: : 51 % RH
- Atmospheric Pressure: : 101.2kPa
- Test Voltage : AC 120V/60Hz

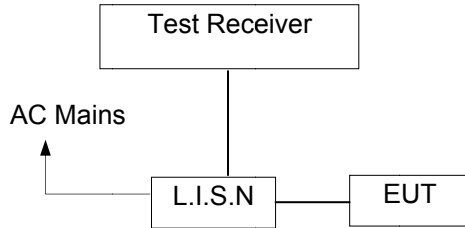
5.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10: 2013.





5.3 Test SET-UP (Block Diagram of Configuration)



5.4 Measurement Procedure:

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

5.5 Conducted Emission Limit

Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:

1. The lower limit shall apply at the transition frequencies
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

5.6 Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

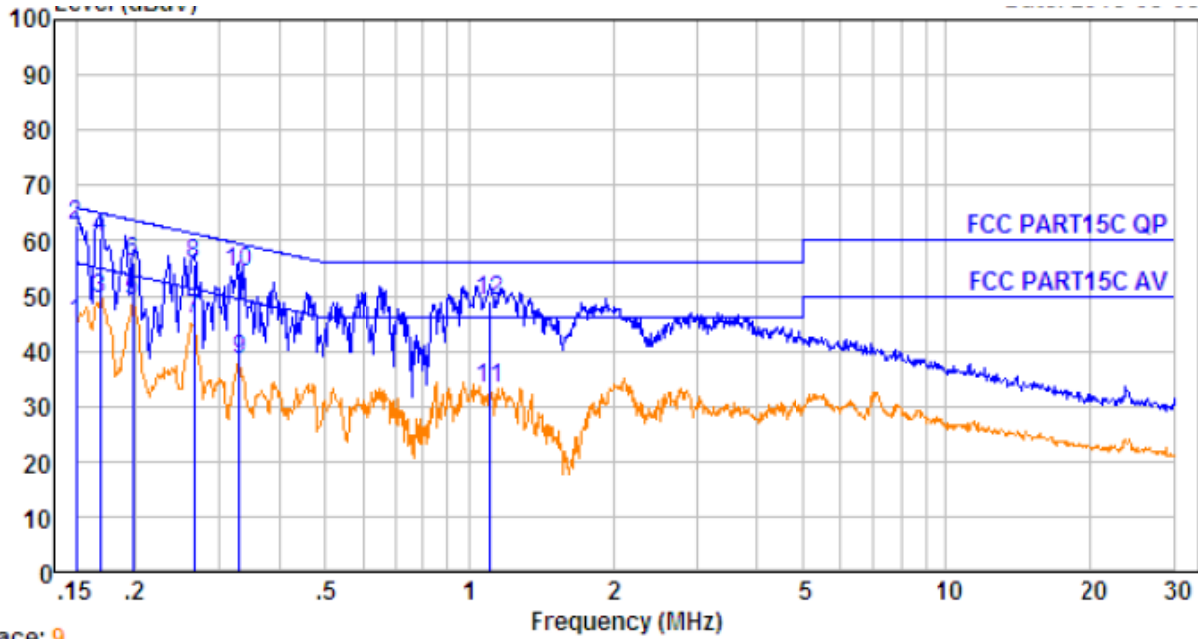
5.7 Conducted Emission Test Result

Pass

Please find the following pages.



Test Phase: Line:

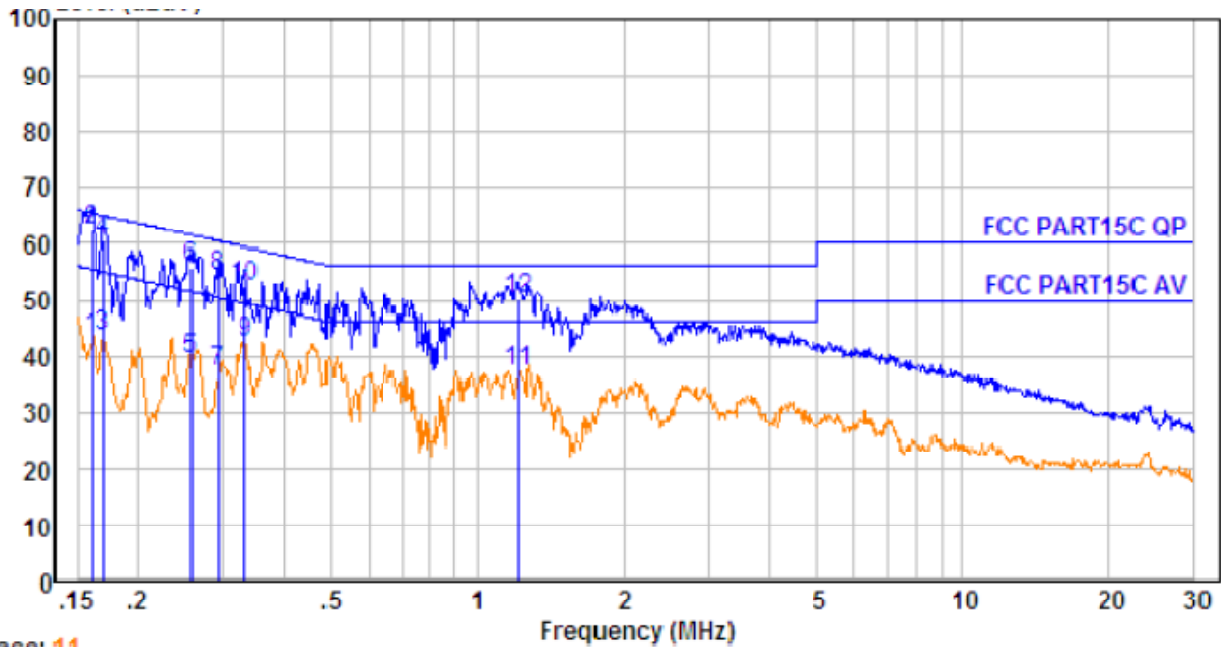


Trace: 9

No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.150	0.21	9.50	35.13	44.84	56.00	-11.16	Average
2.	0.150	0.21	9.50	53.13	62.04	66.00	-3.16	QP
3.	0.169	0.24	9.53	39.65	49.42	55.03	-5.61	Average
4.	0.169	0.24	9.53	50.65	60.42	65.03	-4.61	QP
5.	0.198	0.28	9.59	39.32	49.19	53.71	-4.52	Average
6.	0.198	0.28	9.59	46.32	56.19	63.71	-7.52	QP
7.	0.264	0.34	9.65	35.69	45.68	51.29	-5.61	Average
8.	0.264	0.34	9.65	45.69	55.68	61.29	-5.61	QP
9.	0.330	0.38	9.69	28.15	38.22	49.44	-11.22	Average
10.	0.330	0.38	9.69	44.15	54.22	59.44	-5.22	QP
11.	1.106	0.46	9.82	22.86	33.14	46.00	-12.86	Average
12.	1.106	0.46	9.82	38.86	49.14	56.00	-6.86	QP



Test Phase: Neutral



Trace: 11

No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.161	0.22	9.55	33.52	43.29	55.43	-12.14	Average
2.	0.161	0.22	9.55	52.41	62.18	65.43	-3.25	QP
3.	0.170	0.24	9.57	33.67	43.48	54.94	-11.46	Average
4.	0.170	0.24	9.57	50.70	60.51	64.94	-4.43	QP
5.	0.258	0.34	9.67	29.60	39.61	51.51	-11.90	Average
6.	0.258	0.34	9.67	45.63	55.64	61.51	-5.87	QP
7.	0.292	0.36	9.70	27.04	37.10	50.46	-13.36	Average
8.	0.292	0.36	9.70	44.17	54.23	60.46	-6.23	QP
9.	0.334	0.38	9.73	32.23	42.34	49.35	-7.01	Average
10.	0.334	0.38	9.73	42.30	52.41	59.35	-6.94	QP
11.	1.216	0.46	9.86	26.82	37.14	46.00	-8.86	Average
12.	1.216	0.46	9.86	39.88	50.20	56.00	-5.80	QP



6 Radiated Spurious Emissions

Test Requirement: : FCC CFR47 Part 15 Section 15.231 & 15.207 &15.205
 Test Method: : ANSI C63.10:2013
 Test Result: : PASS
 Measurement Distance: : 3m
 Limit: : See the follow table

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	20log ^{(2400/F(kHz))} + 80
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	20log ^{(24000/F(kHz))} + 40
1.705 ~ 30	30	30	100 * 30	20log ⁽³⁰⁾ + 40
30 ~ 88	100	3	100	20log ⁽¹⁰⁰⁾
88 ~ 216	150	3	150	20log ⁽¹⁵⁰⁾
216 ~ 960	200	3	200	20log ⁽²⁰⁰⁾
Above 960	500	3	500	20log ⁽⁵⁰⁰⁾

Note:

1. The tighter limit applies at the band edges.
2. Emission level (dBuV/m)=20log Emission level(uV/m)



Limits of Radiated Emission Measurement (FCC 15.231)

Frequency (MHz)	Field Strength of Fundamental (Microvolts/meters)	Field Strength of Unwanted Emissions (Microvolts/meters)
40.66-40.70	2250.00	225.00
70-130	1250.00	125.00
130-174	1250 to 3750**	125 to 375**
174-260	3750	375
260-470	3750 to 12500**	375 to 1250**
Above 470	12500	1250

Note:

** linear interpolations. Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows:

For the Band 130-174MHz, uV/m at 3 meters = 56.81818(F)-6136.3636;

For the Band 260-470MHz, uV/m at 3 meters = 41.6667(F)-7083.3333;

The maximum permitted unwanted emission level is 20dB below the maximum permitted fundamental level.

The limited on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in 93 section 15.209, whichever limit permits a higher field strength.

6.1 EUT Operation

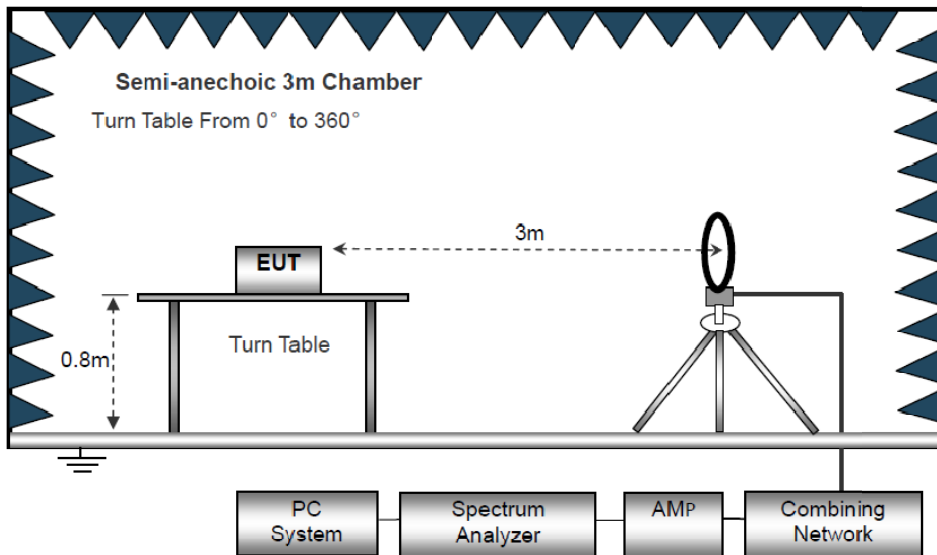
Operating Environment :

- Temperature: : 23.5 °C
- Humidity: : 51.1 % RH
- Atmospheric Pressure: : 101.2kPa

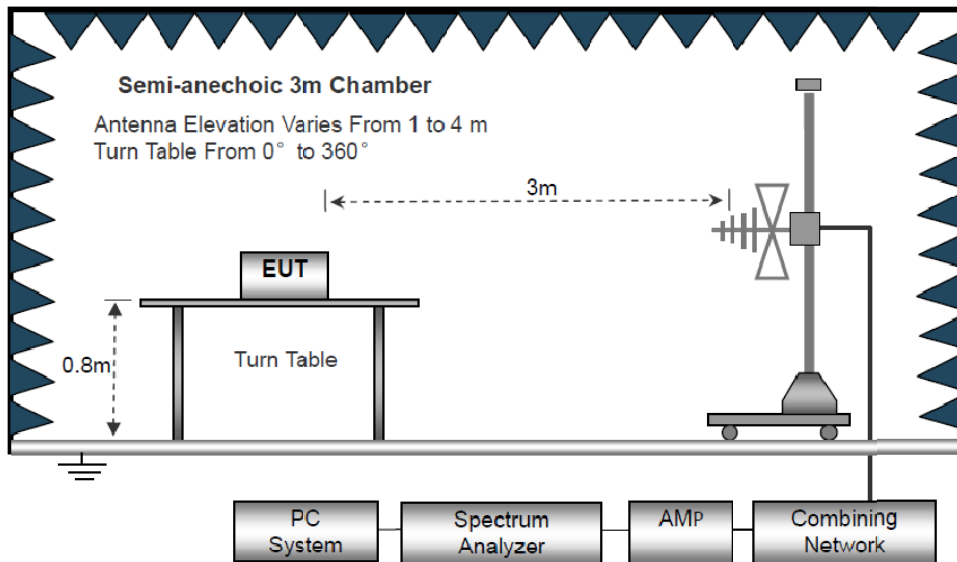
6.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

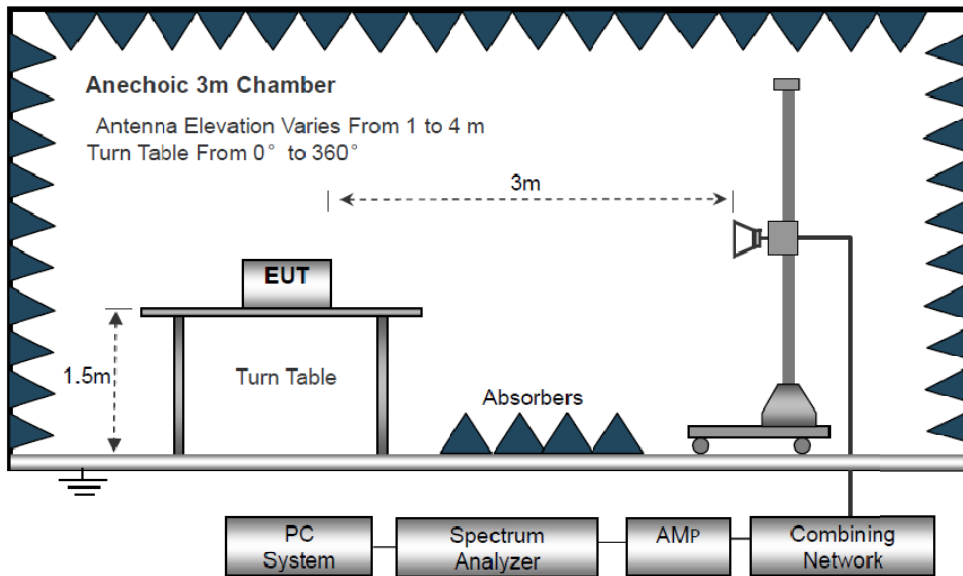
The test setup for emission measurement below 30MHz



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz



6.3 Spectrum Analyzer Setup

	Frequency	Detector	RBW	VBW	Remark
Receiver Setup	Below 30MHz	--	10kHz	10kHz	--
	30MHz ~ 1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		RMS	1MHz	3MHz	Average Value



6.4 Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10-2013.
2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.
3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (From 1m to 4m) and turntable (from 0 degree to 360 degree) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Final measurement (Above 1GHz): The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1MHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 degree to 360 degree in order to have the antenna inside the cone of radiation.
7. Test Procedure of measurement (For Above 1GHz):
 - 1) Monitor the frequency range at horizontal polarization and move the antenna over all sides of the EUT(if necessary move the EUT to another orthogonal axis).
 - 2) Change the antenna polarization and repeat 1) with vertical polarization.
 - 3) Make a hardcopy of the spectrum.
 - 4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
 - 5) Change the analyser mode to Clear/ Write and found the cone of emission.
 - 6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3m and the antenna will be still inside the cone of emission.
 - 7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarization and azimuth and the peak and average detector, which causes the maximum emission.
 - 8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.
8. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.



6.5 Summary of Test Results

Test Frequency: 9KHz-30MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
--	--	--	--	>20

Note:

The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor = $40\log(\text{Specific distance/ test distance})$ (dB);
Limit line = Specific limits (dBuV) + distance extrapolation factor.



Test Frequency: 30MHz ~ 5GHz

Note: Due to the PK results are lower than the AV limits already, the Duty Cycle evaluation and AV measurement are not required for this case.

Frequency	Polar	Cable Loss	ANT Factor	Reading	Corrected Factor	Emission Level	Limit	Margin	Detector Type
(MHz)	(H/V)	(dB)	(dB/m)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
37.945	V	1.27	13.55	38.70	30.05	23.47	40.00	-16.53	QP
46.995	V	1.46	12.85	41.09	30.13	25.27	40.00	-14.73	QP
159.784	V	2.57	13.88	44.15	30.55	30.05	43.50	-13.45	QP
351.708	V	3.28	14.27	34.61	30.83	21.33	46.00	-24.67	QP
490.745	V	3.59	16.98	33.70	30.94	23.33	46.00	-22.67	QP
760.704	V	3.98	21.38	30.00	31.09	24.27	46.00	-21.73	QP
53.693	H	1.58	11.99	31.01	30.17	14.41	40.00	-25.59	QP
102.360	H	2.17	10.44	29.30	30.40	11.51	43.50	-31.99	QP
159.784	H	2.57	13.88	44.43	30.55	30.33	43.50	-13.17	QP
351.708	H	3.28	14.27	37.18	30.83	23.90	46.00	-22.10	QP
576.644	H	3.73	18.55	34.56	31.00	25.84	46.00	-20.16	QP
785.093	H	4.01	21.55	30.76	31.11	25.21	46.00	-20.79	QP

Note:

Emission Level= Cable Loss + ANT Factor + Reading – Corrected Factor

Margin=Emission Level – Limit



Frequency	Reading	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.231/209/205	
			Height	Polar			Limit	Margin
(MHz)	(dBµV)	Degree	(m)	(H/V)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
908.42	80.14	246	2.14	H	-11.05	69.09	82	-12.91
908.42	79.32	263	2.09	V	-11.05	68.27	82	-13.73
1816.84	48.05	214	2.18	H	-9.35	38.7	54	-15.3
1816.84	47.62	228	1.57	V	-9.35	38.27	54	-15.73
2725.26	46.32	235	1.84	H	-8.14	38.18	54	-15.82
2725.26	45.73	218	2.16	V	-8.14	37.59	54	-16.41
3633.68	44.69	219	2.36	H	-7.23	37.46	54	-16.54
3633.68	41.57	201	2.45	V	-7.23	34.34	54	-19.66
4542.10	40.29	195	2.57	H	-6.83	33.46	54	-20.54
4542.10	38.56	184	2.63	V	-6.83	31.73	54	-22.27

Note:

1. Emissions attenuated more than 20dB below the permissible value are not reported.
2. *: denotes restricted band of operation. Measurements were made using a peak detector and average detector. Any emission falling within the restricted bands of FCC Part 15 Section 15.205 are compliance with the emission limit of FCC Part 15 Section 15.209.
3. FCC Limit for Average Measurement= $20\log 12500=82\text{dBuV/m}$.



7 20dB Bandwidth Measurement

Test Requirement : FCC Part15.231(c)
 Test Method : FCC Part15.231(c)
 Test Mode : Refer to section 3.3

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 20dB down from the modulated carrier.

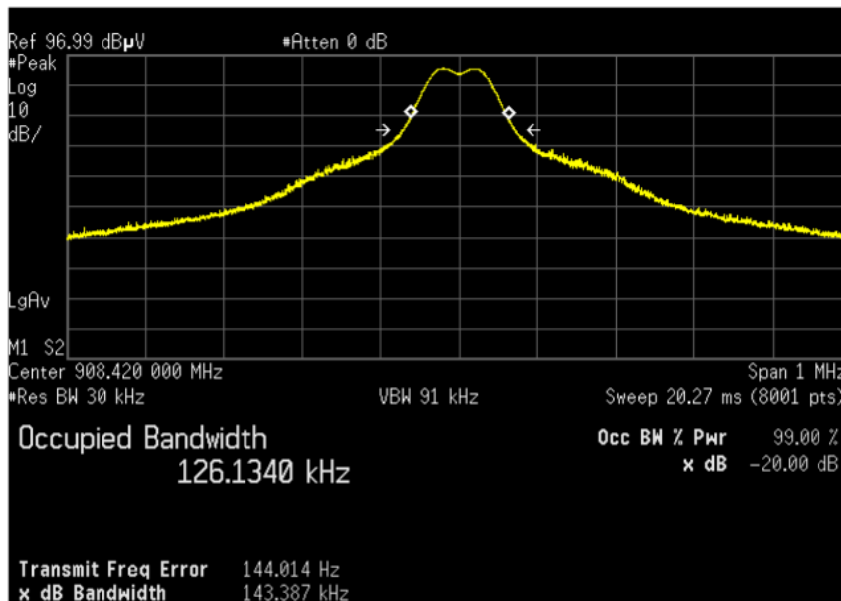
7.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 30 kHz, VBW = 91kHz

7.2 Test Result

Test Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
908.42	143.387	4542	pass

Test plots





8 Transmitter Timeout

8.1 Requirements

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

Result: The EUT has a manually activated transmitter, please refer to below detail data.

A transmitter activated automatically shall cease transmission within 5 seconds after activation.

Result: The EUT does not have a automatically activated transmitter.

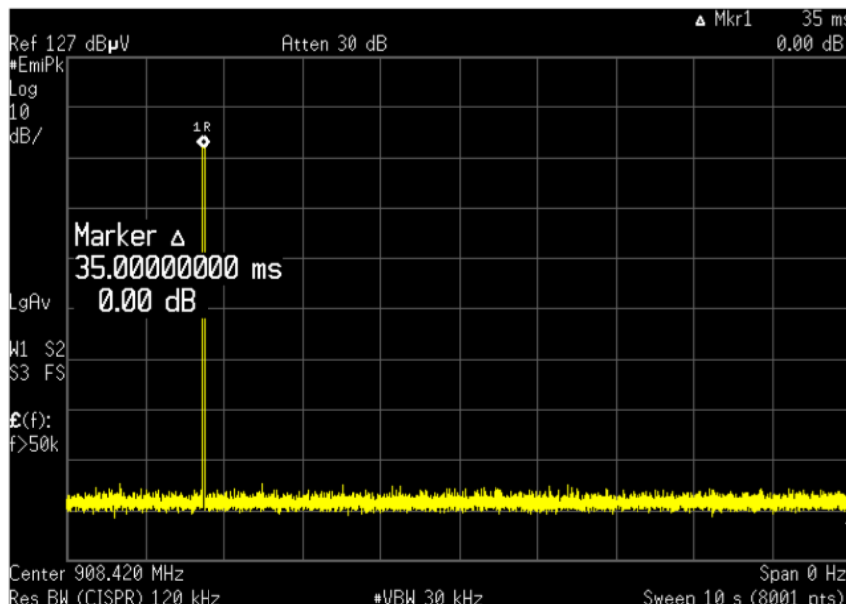
Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

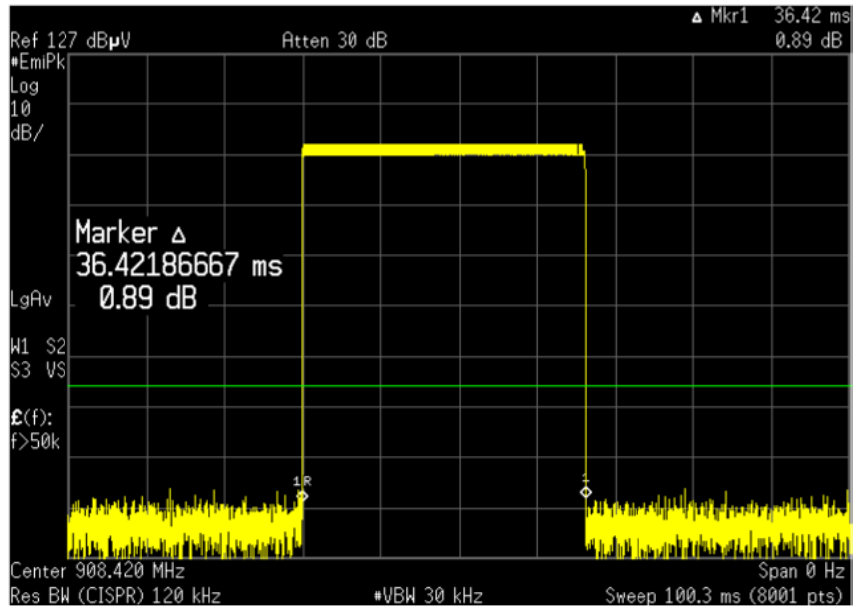
Result: The EUT does not employ periodic transmission.

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: The section is not applicable to EUT.

The Duration of Each Transmission	Limit	Result
0.0364s	<5s	Pass







PRECISE TESTING

Report No.: PTC18080610901E-FC01

9 Antenna Requirement

According to the FCC part15.203, a transmitter can only be sold or operated with antennas with which it was approved. This product has an internal permanent antenna which meet the requirement of this section.

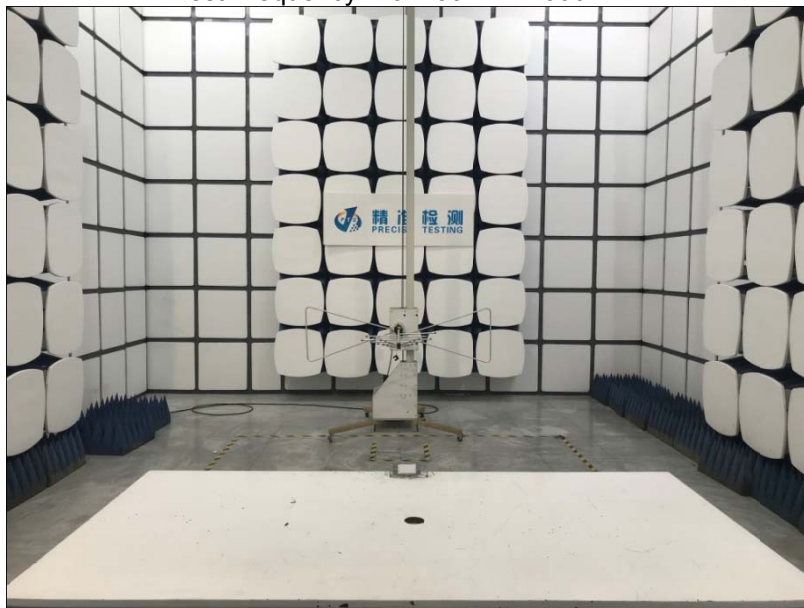


10 Test Setup

Conducted Emissions



Radiated Spurious Emissions Test Frequency From 30MHz-1000MHz



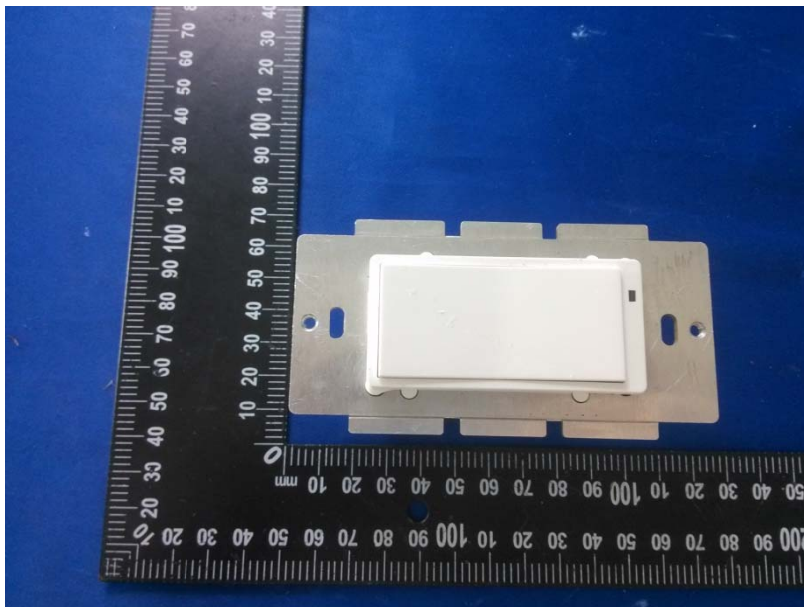
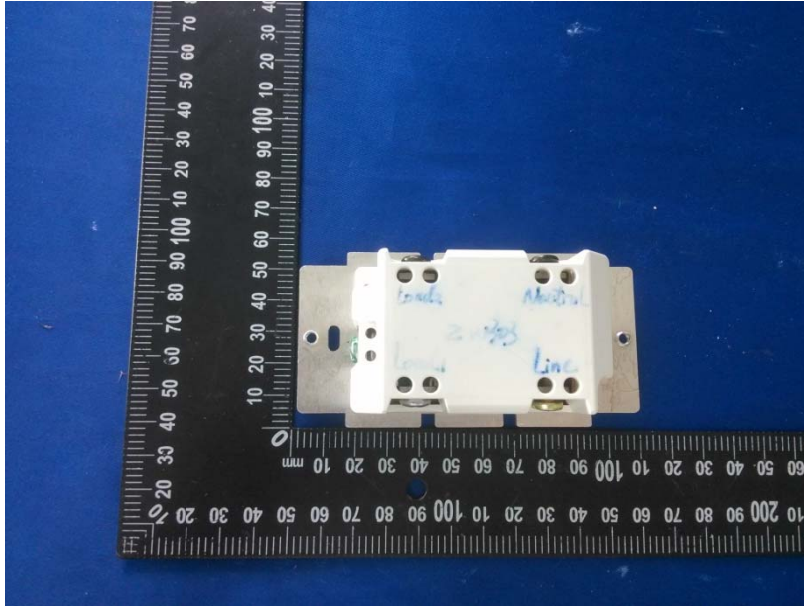


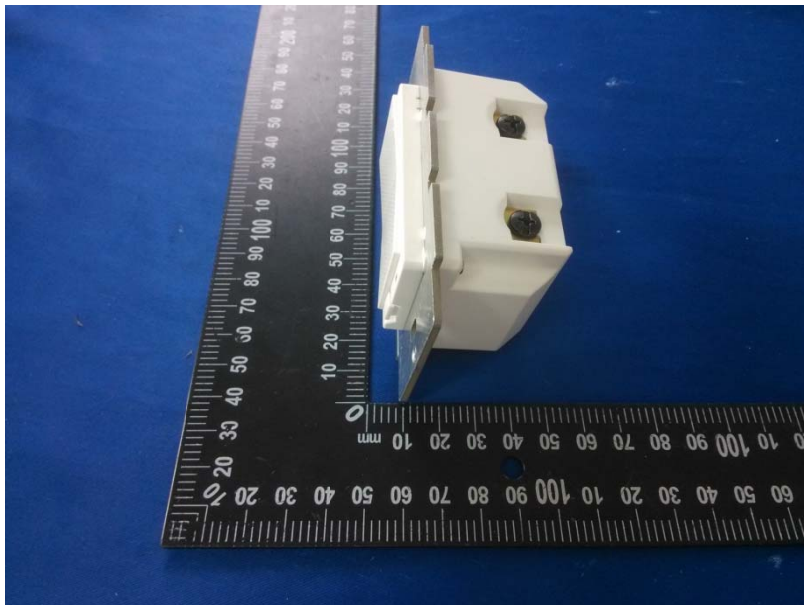
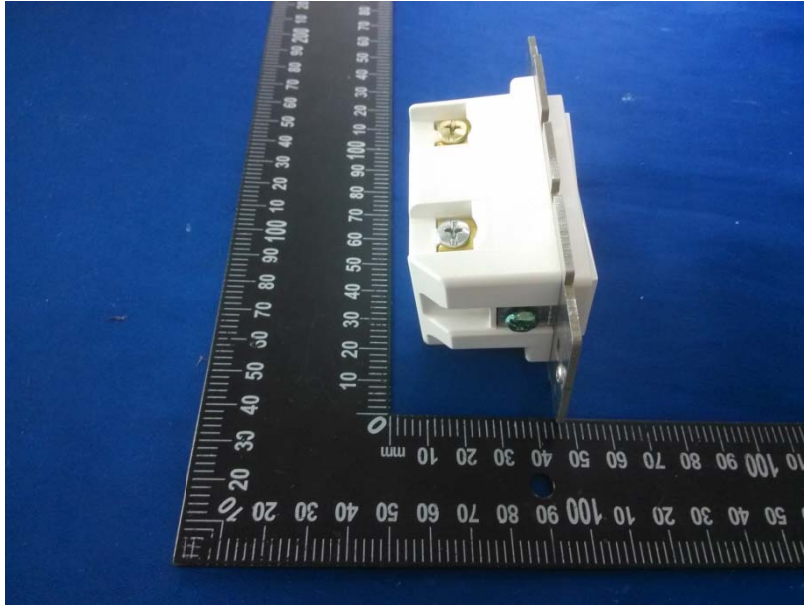
Test frequency from 1GHz-18GHz

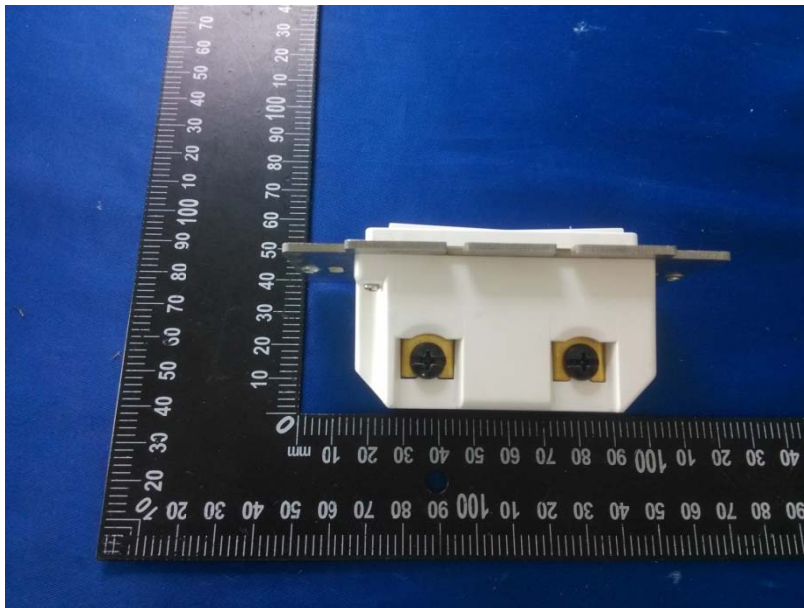
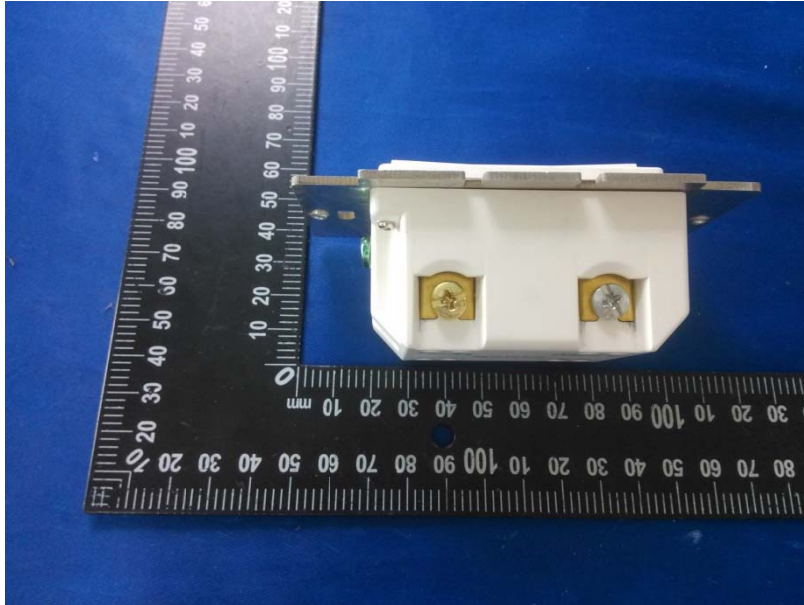


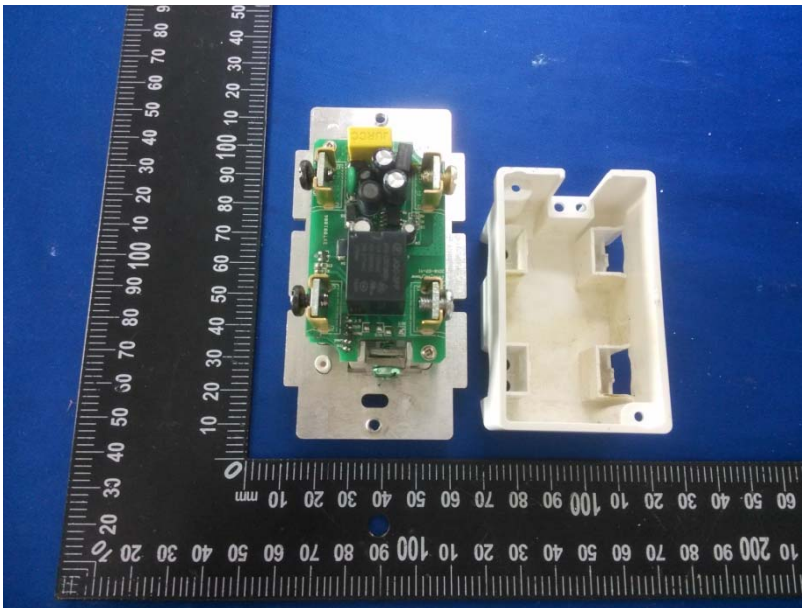
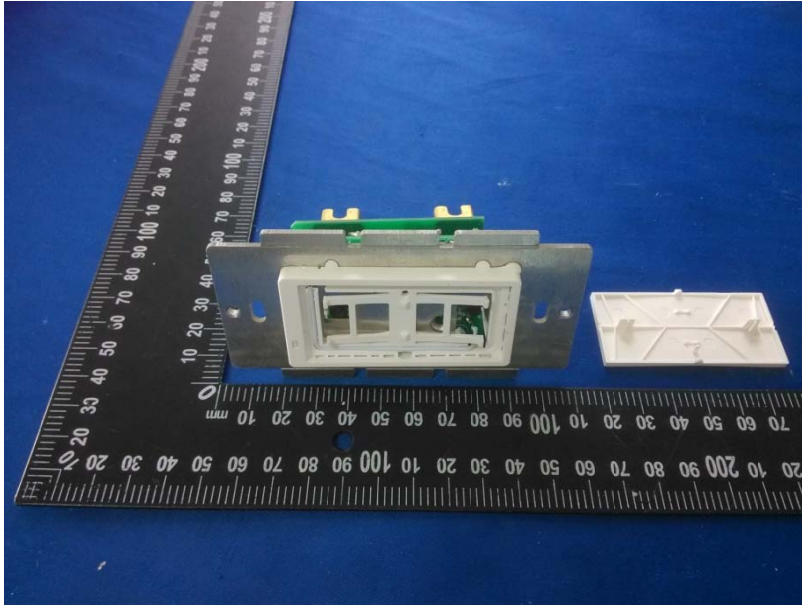


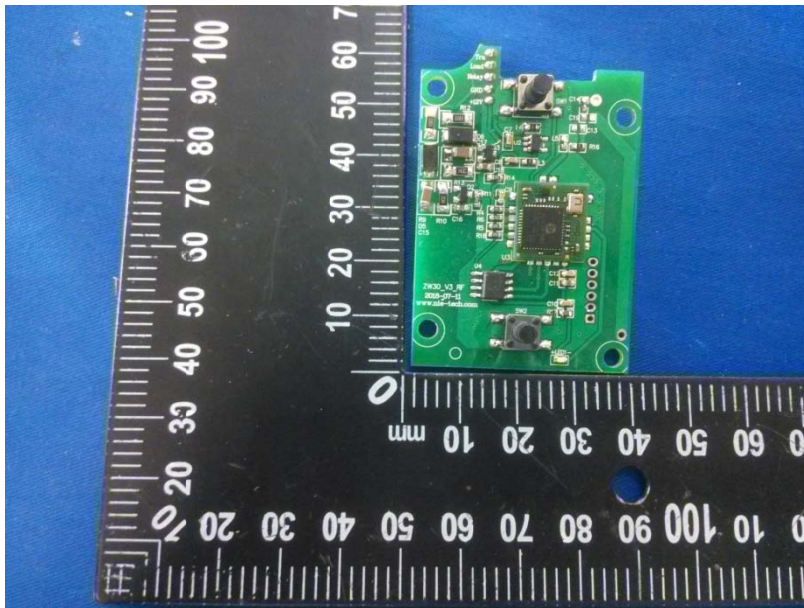
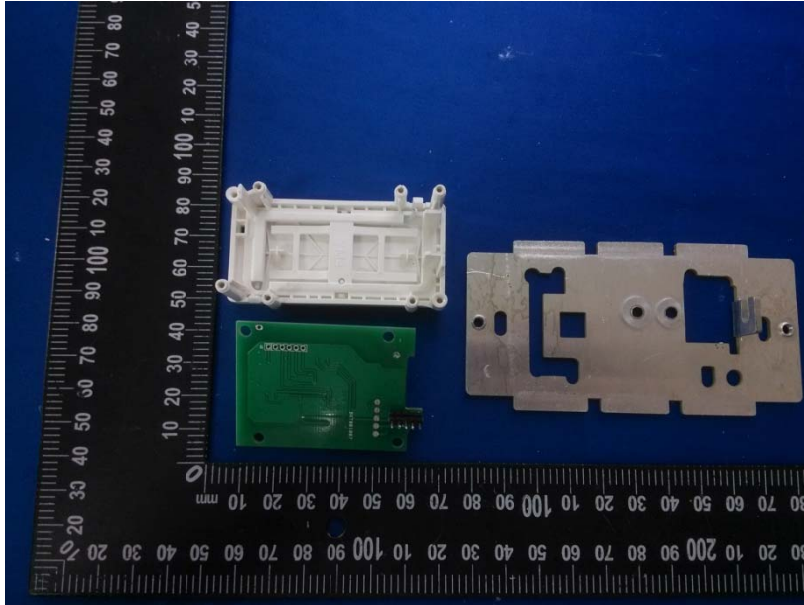
11 EUT Photos

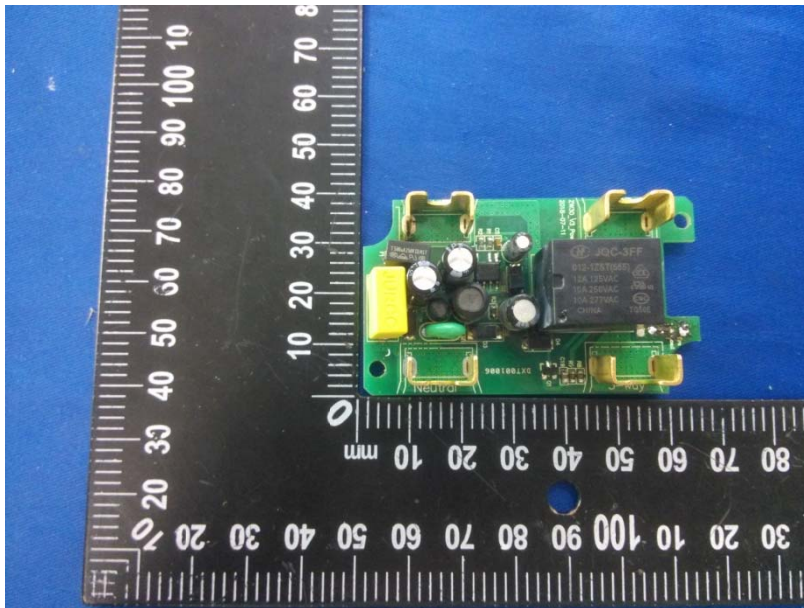
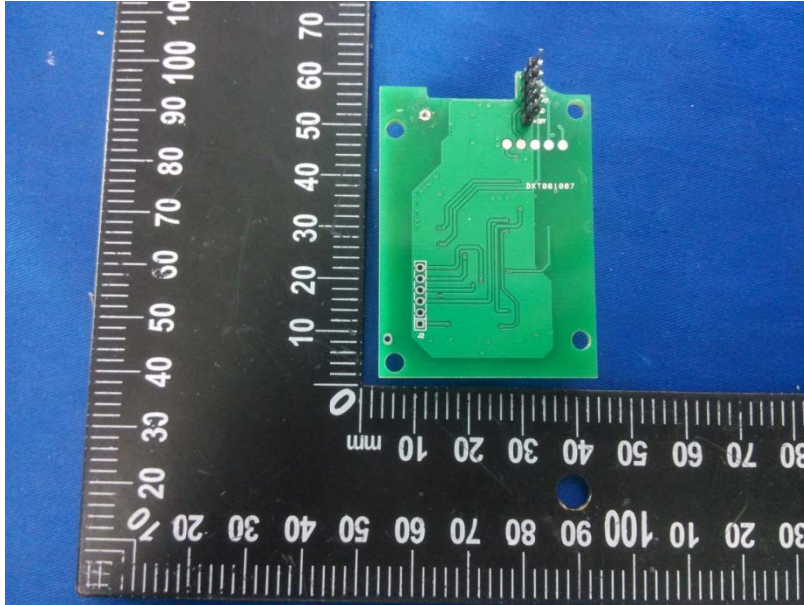


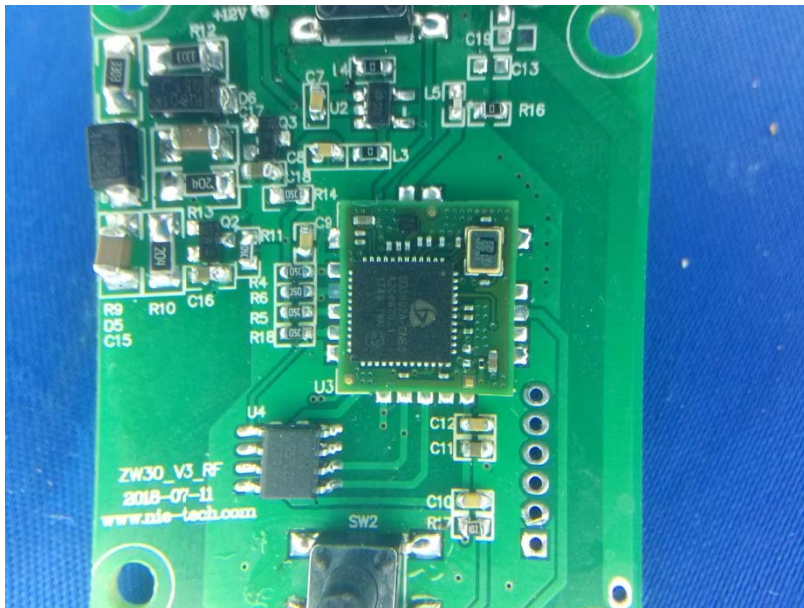
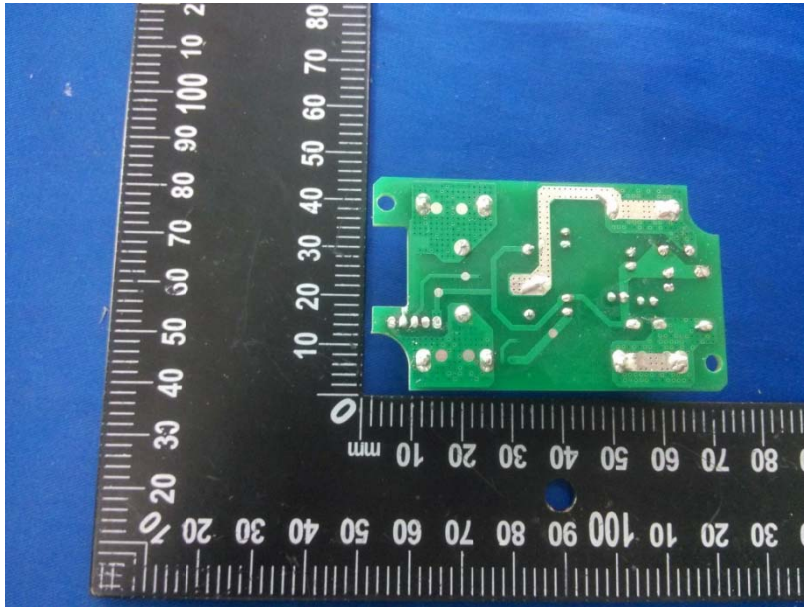












*****THE END REPORT*****