

FCC - TEST REPORT

Report Number : **64.790.15.03715.01** Date of Issue: 2015-12-15

Model : 51012P.

Product Type : Pushbutton module, with NFC/IC card reader

Applicant : ABB Genway Xiamen Electrical Equipment Co.,Ltd

Address : Room 501-1, No.12-14, 3rd Chuang Xin Road, Torch High Technology Development Zone, Xiamen S.E.Z, Fujian Province, P.R.China

Production Facility : ABB Genway Xiamen Electrical Equipment Co.,Ltd

Address : NO.7 Fangshan South Road, Torch High Technology Development Zone (Xiang An) Industrial Zone, Xiamen S.E.Z, Fujian Province, P.R.China

Test Result : ☒ **Positive** ☐ **Negative**



Total pages including Appendices : 30

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park,
Nantou Checkpoint Road 2, Nanshan District,
Shenzhen City, 518052,
P. R. China

FCC Registration Number: 502708
IC Registration Number: 10320A

Telephone: 86 755 8828 6998
Fax: 86 755 8828 5299

Test Site 2

Company name: Guangzhou GRG Metrology And Test Technology LTD.
No.163 PingYun Road, West of HuangPu Road, GuangZhou, Guangdong,
P.R.China

Telephone: 86 20 38699960
Fax: 86 20 38695185
FCC Registration Number: 688188
IC Registration Number: 8355A-1

3 Description of the Equipment Under Test

Product:	Pushbutton module, with NFC/IC card reader
Model no.:	51012P.
FCC ID:	2AEBL-51012P
Brand Name:	ABB
Options and accessories:	N/A
Rating:	Input: DC 5V
RF Transmission Frequency:	13.56MHz
Modulation:	ASK
Antenna Type:	PCB layout loop antenna
Description of the EUT:	EUT is a card reader module, it can be grouped with other modules to act as a part of door entry system.

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2014 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-Gen Issue 4 November 2014	General Requirements for Compliance of Radio Apparatus
RSS-210 Issue 8 December 2010	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

All the test methods were according to ANSI C63.4 (2014).

5 Summary of Test Results

Technical Requirements					
Test Condition			Pages	Test Site	Test Result
FCC Rules	RSS Requirements	Test Item	10	2	P
§15.207	RSS-Gen Issue 4 clause 8.8	Conducted emission AC power port			
§15.225(a), (b), (c), (d), 15.209, 15.205	RSS-210 Issue 8 A2.6(a), (b), (c), (d), RSS-Gen Issue 4 clause 8.10	Filed Strength Measurement	15	1	P
§15.225 (e)	RSS-210 Issue 8 A2.6(e)	Frequency Stability	18	1	P
§15.215(c)	RSS-Gen Issue 4 clause 6.6	Occupied Bandwidth	19	1	P

Note 1: N/A=Not Applicable.

6 General Remarks

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

□ - **Not** Performed

The Equipment Under Test

■ - **Fulfills** the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: 2015-08-25

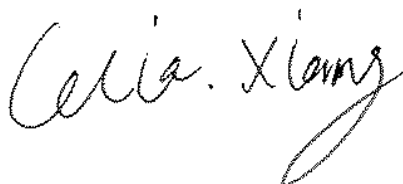
Testing Start Date: 2015-08-27

Testing End Date: 2015-10-27

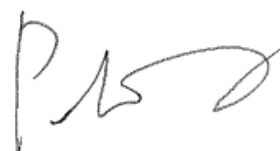
- TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch -

Reviewed by:

Prepared by:



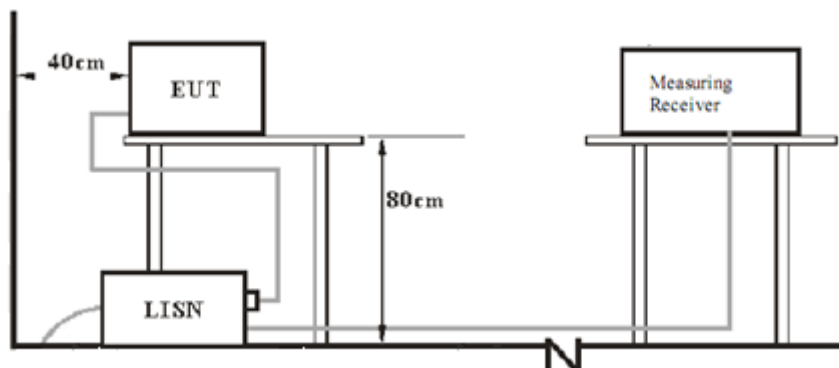
Celia Xiang



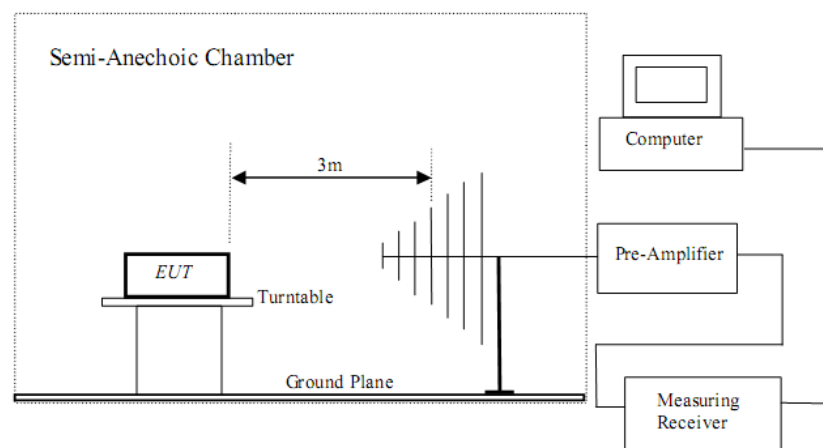
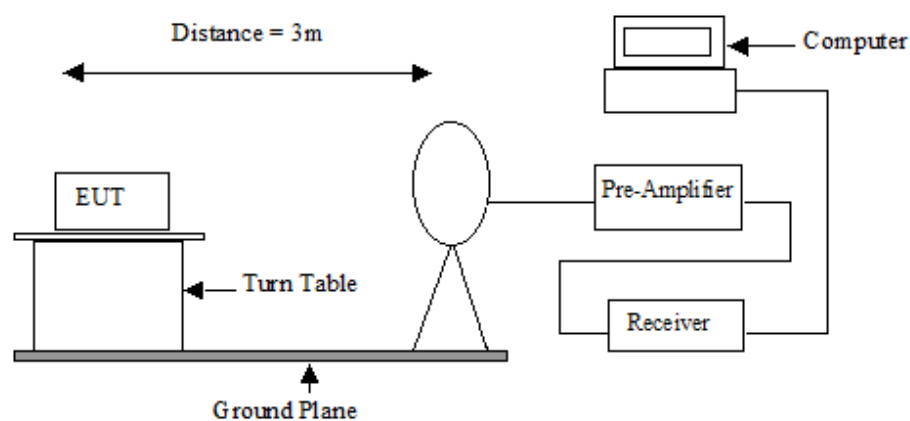
Peter Jia

7 Test Setups

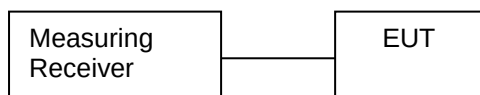
7.1 AC Power Line Conducted Emission test setups



7.2 Radiated test setups



7.3 Conducted RF test setups



8 Test Methodology

8.1 Conducted Emission

The EUT was placed on a table, which is 0.8m above ground plane, the power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).

Maximum procedure was performed to ensure EUT compliance, A EMI test receiver is used to test the emissions from both sides of AC line.

8.2 Radiated Emission

The sample was placed 0.8m above the ground plane on a standard emission test site *. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, considered typical configuration, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

*On a standard emission test site with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules.

8.3 Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

$$FS = R + \text{System Factor}$$

$$\text{System Factor} = AF + CF + FA - PA$$

Where FS = Net Field Strength in dBuV/m at 3 meters.

R = Reading of Spectrum Analyzer / Test Receiver in dBuV.

AF = Antenna Factor in dB.

CF = Cable Attenuation Factor in dB.

FA = Filter Attenuation Factor in dB.

PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

9 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.	REMARK
System controller	ABB	M2300	Input: 100-240 V a.c., 50/60 Hz, 1.0 A; output: 28.0 V d.c., 1.2 A
Camera module	ABB	M251021C	Input: 20-30 V d.c., 3W
Audio module	ABB	M251021A-	Input: 20-30 V d.c., 4W

Remark: All the auxiliary equipments are used to make this "Pushbutton module, with NFC/IC card reader" works as its representative configuration for conducted emission test.

10 Technical Requirement

10.1 Conducted Emission Measurement

Test Requirement:

FCC part 15 section 15.207
RSS-Gen Issue 4 section 8.8

Limits of 15.207:

Frequency (MHz)	Conducted limit(dB μ V)	
	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.

Test Method:

ANSI C63.4:2014

Test Date:

2015-08-27 ~ 2015-10-26

Mode of Operation:

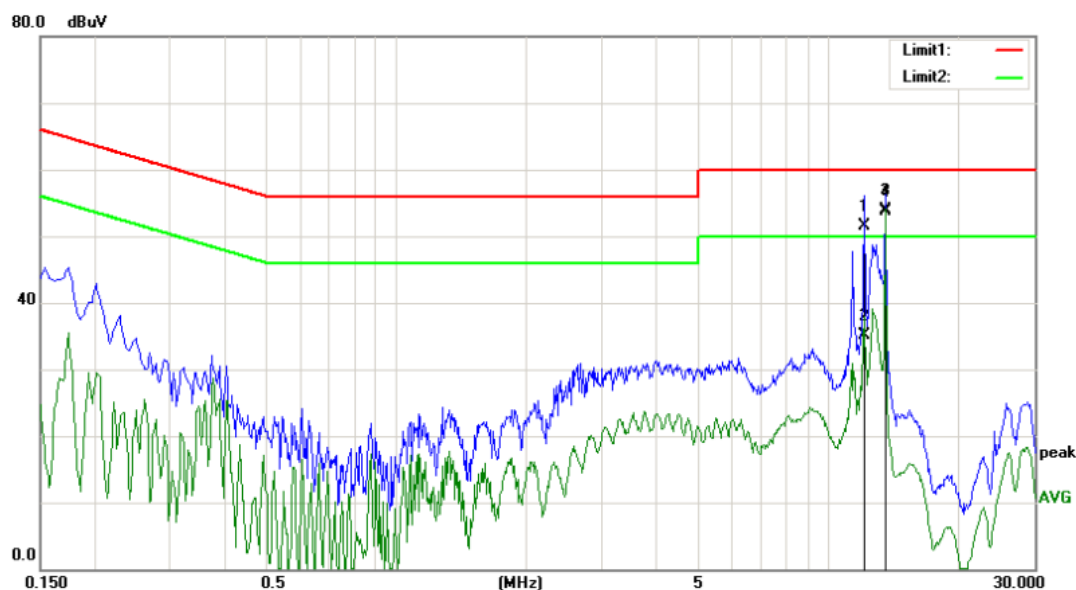
Test EUT in a representative configuration that can read card.

Detector Function

Quasi-peak and Average

Test data:

Conducted emission



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector
1		12.0900	44.70	6.80	51.50	60.00	-8.50	QP
2		12.0900	28.30	6.80	35.10	50.00	-14.90	AVG
3		13.5620	47.20	6.80	54.00	60.00	-6.00	QP
4	*	13.5620	47.00	6.80	53.80	50.00	3.80	AVG

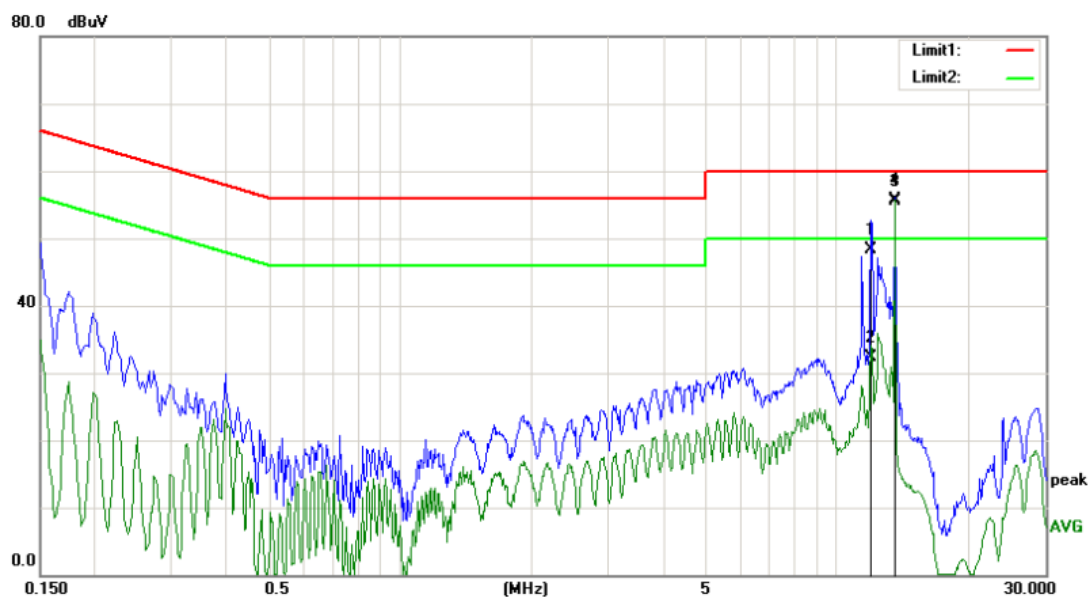
Operating Mode : Test EUT in a representative configuration with the permanent antenna.

Conduct Line/Port : L

Test By : Peter Jia

Test Date : 2015-10-26

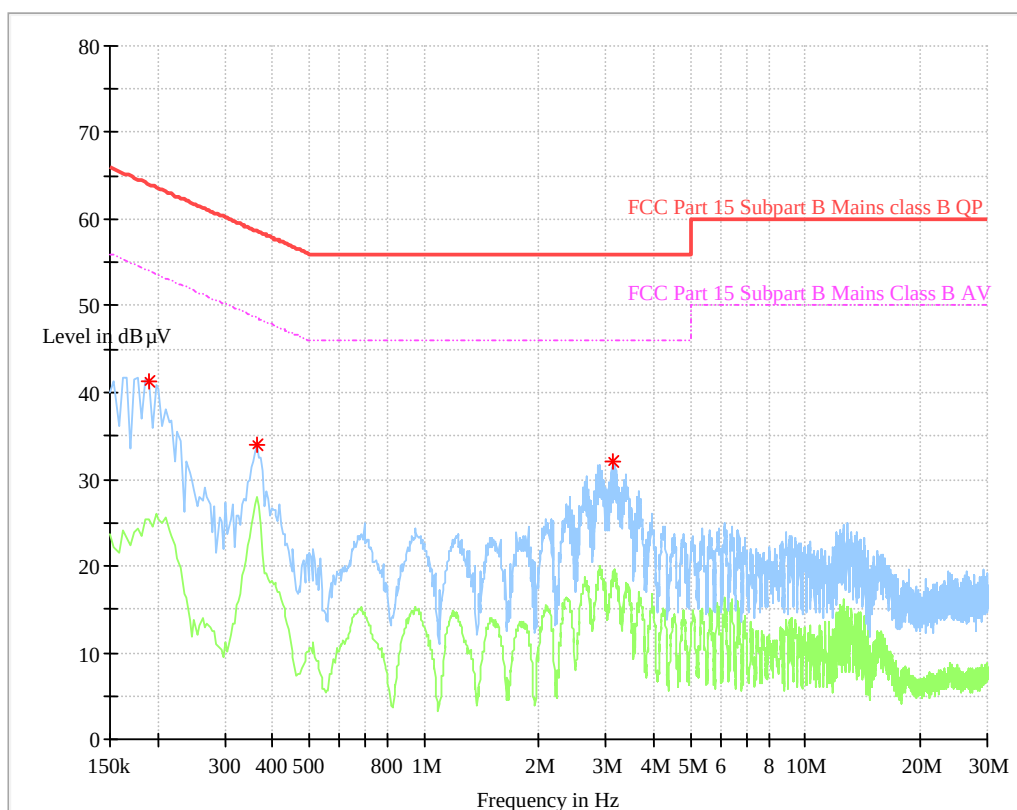
Conducted emission



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector
1		11.9940	41.58	6.82	48.40	60.00	-11.60	QP
2		11.9940	25.58	6.82	32.40	50.00	-17.60	AVG
3		13.5620	48.80	6.80	55.60	60.00	-4.40	QP
4	*	13.5620	49.00	6.80	55.80	50.00	5.80	AVG

Operating Mode : Test EUT in a representative configuration with the permanent antenna.
 Conduct Line/Port : N
 Test By : Peter Jia
 Test Date : 2015-10-26

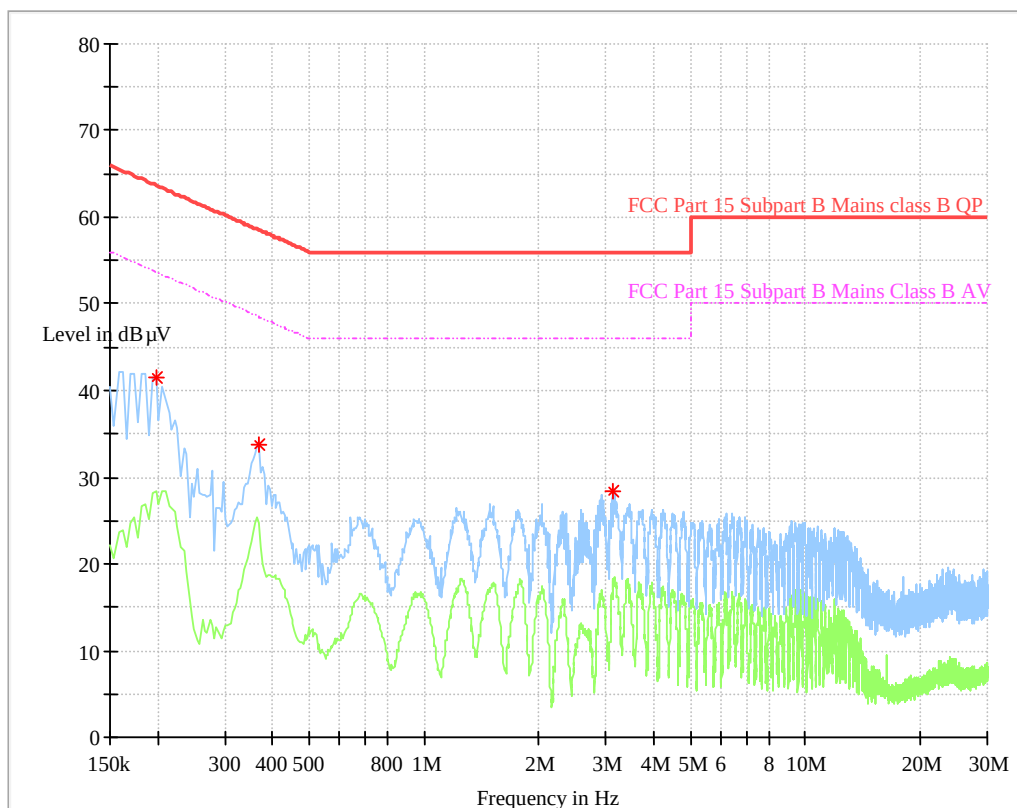
Conducted emission



No significant emission was detected within 10 dB to limit

Operating Mode : Test EUT in a representative configuration with a dummy load in lieu of the permanent antenna.
 Conduct Line/Port : L
 Test By : Peter Jia
 Test Date : 2015-08-27

Conducted emission



No significant emission was detected within 10 dB to limit

Operating Mode : Test EUT in a representative configuration with a dummy load in lieu of the permanent antenna.
Conduct Line/Port : N
Test By : Peter Jia
Test Date : 2015-08-27

Test result: PASS

10.2 Filed Strength Measurement

Test Requirement:

FCC part 15 section 15.225 (a),(b),(c),(d), 15.205 & RSS 210 Issue 8 A2.6 (a),(b),(c),(d)

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110– 14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

Limits of 15.209:

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

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

Test Method:

ANSI C63.4:2014

Test Date:

2015-10-27

Mode of Operation:

Continuously transmitting mode.

Detector Function

Quasi-peak (Below 1000 MHz)
Average and Peak (Above 1000 MHz)

Measurement BW

200Hz(9KHz-150KHz)
9KHz(150KHz-30MHz)
120 kHz (30MHz-1000 MHz)
1 MHz (Above 1000 MHz)

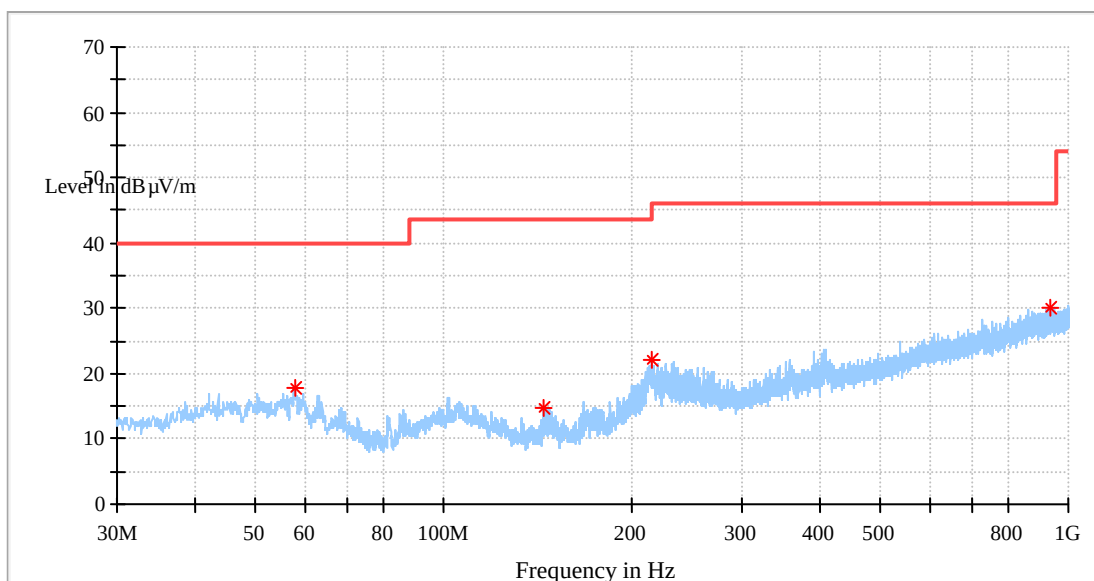
Test data:

Emission 9KHz-30MHz

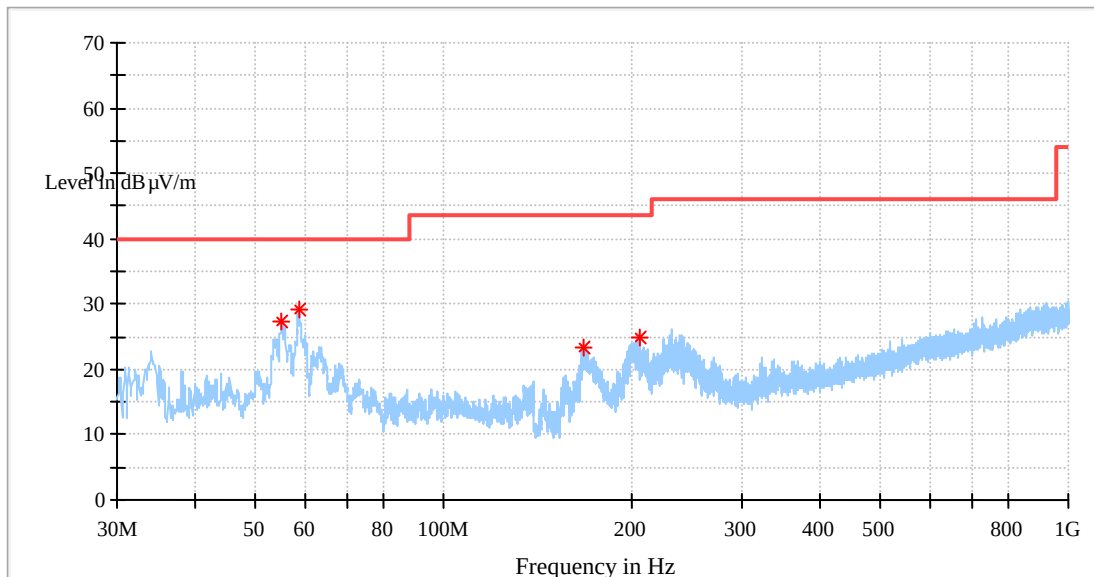
Frequency (MHz)	Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)	Remark
0.103987	34.35	107.26	72.90	H	20.0	QP
0.135994	31.54	104.93	73.39	H	20.0	PEAK
0.226886	40.03	100.48	60.45	H	19.9	PEAK
0.516341	36.39	73.35	36.96	H	19.9	QP
1.036455	35.68	67.31	31.63	H	19.9	QP
1.683205	34.12	63.11	28.99	H	20.0	QP
4.767705	34.27	69.50	35.23	H	19.9	QP
6.780318	34.49	69.50	35.01	H	19.9	QP
13.559886	44.65	123.90	79.25	H	20.0	QP
27.173295	34.79	69.50	34.71	H	20.7	QP

Frequency (MHz)	Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)	Remark
0.009000	58.02	128.50	70.48	V	20.5	PEAK
0.101778	34.84	107.44	72.60	V	20.0	QP
0.135994	32.69	104.93	72.24	V	20.0	PEAK
0.226886	40.36	100.48	60.12	V	19.9	PEAK
0.516341	36.90	73.35	36.45	V	19.9	QP
1.090727	34.88	66.87	31.99	V	19.9	QP
1.701296	34.16	63.02	28.86	V	20.0	QP
5.043591	34.21	69.50	35.29	V	19.8	QP
13.559886	44.97	123.90	78.93	V	20.0	QP
23.537023	35.04	69.50	34.46	V	20.7	QP

Emission 30MHz -1GHz



Frequency (MHz)	QP (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol
57.826875	17.66	40.00	22.34	H
144.945000	14.88	43.50	28.62	H
215.148750	22.09	43.50	21.41	H
935.313125	30.17	46.00	15.83	H



Frequency (MHz)	QP (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol
55.098750	27.42	40.00	12.58	V
58.736250	29.21	40.00	10.79	V
167.436875	23.35	43.50	20.15	V
205.266875	24.87	43.50	18.63	V

Test result: PASS

10.3 Frequency Stability

Test Requirement:	FCC Part 15 C Section 15.225(e) RSS-210 Issue 8 A2.6(e) The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.
Test Method:	ANSI C63.4:2014
Test Date:	2015-10-27
Mode of Operation:	Continuously transmitting mode.
Detector Function	Maxpeak
Measurement BW	RBW:1KHz VBW:3KHz

Test data:

Nominal Operating Frequency: 13.559MHz,
Limit: within +/- 1.3559KHz of the operating frequency.

Frequency stability vs. temperature		
Temperature (°C)	Measured Frequency (MHz)	Frequency error (KHz)
50	13.56020	1.20
40	13.55994	0.94
30	13.55994	0.94
20	13.55994	0.94
10	13.55994	0.94
0	13.55992	0.92
-10	13.55992	0.92
-20	13.55994	0.94

Frequency stability vs. voltage		
Voltage (VDC)	Measured Frequency (MHz)	Frequency error (KHz)
4.25	13.55992	0.92
4.5	13.55994	0.94
4.75	13.56020	1.20
5.0	13.55994	0.94
5.25	13.55992	0.92
5.5	13.55992	0.92
5.75	13.55992	0.92

Result: PASS

10.4 Occupied Bandwidth

Test Requirement:

FCC Part 15 C Section 15.215 (c)

RSS-Gen Issue 4 section 6.6

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the 20 dB bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Test Method:

ANSI C63.4:2014

Test Date:

2015-10-27

Mode of Operation:

Continuously transmitting mode.

Detector Function

Maxpeak

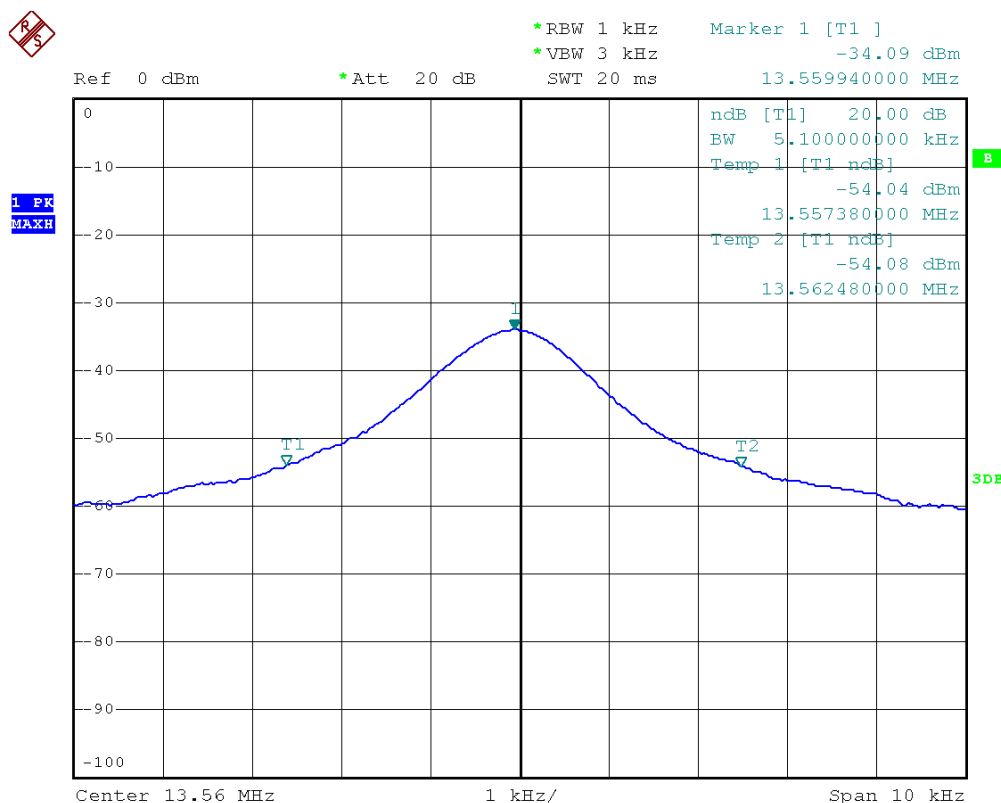
Measurement BW

RBW:1KHz

VBW:3KHz

Test data:

20dB bandwidth:



99% bandwidth



*RBW 1 kHz
*VBW 3 kHz
SWT 20 ms

Marker 1 [T1]

-13.33 dBm

13.559920000 MHz

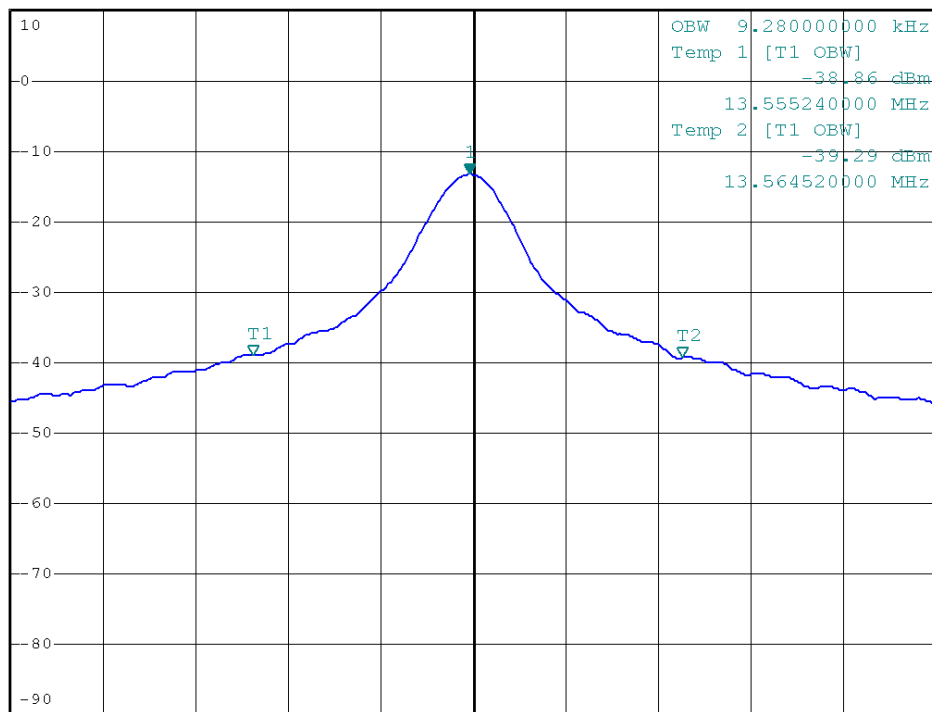
Ref 10 dBm

*Att 20 dB

SWT 20 ms

1 PK
MAXH

2 PK
MAXH



Center 13.56 MHz

2 kHz/

Span 20 kHz

Result: PASS

11 Test Equipment List

List of Test Instruments

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
C	Signal Analyzer	Rohde & Schwarz	FSV40	101031	2016-7-24
	Programmable temperature and humidity chamber	MHG-408CASI	TaiLi	A81002	2016-7-24
	DC power supply	INSTEK	GPR-30600	EH873394	N/A
CE	EMI Receiver	Rohde & Schwarz	ESCI	100529	2016-7-21
	L.I.S.N (single phase)	SCHWARZBECK	NSLK 8127	8127450	2016-8-21
	EMI Test Receiver	Rohde & Schwarz	ESR 3	101782	2016-7-24
	LISN	Rohde & Schwarz	ENV216	100326	2016-7-24
RE	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100398	2016-7-24
	EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2016-7-24
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2016-8-14
	Horn Antenna	Rohde & Schwarz	HF907	102294	2016-7-24
	Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2016-7-24
	3m Semi-anechoic chamber	TDK	9X6X6	----	2019-5-29

C - Conducted RF tests

- Occupied bandwidth
- Frequency Stability

12 System Measurement Uncertainty

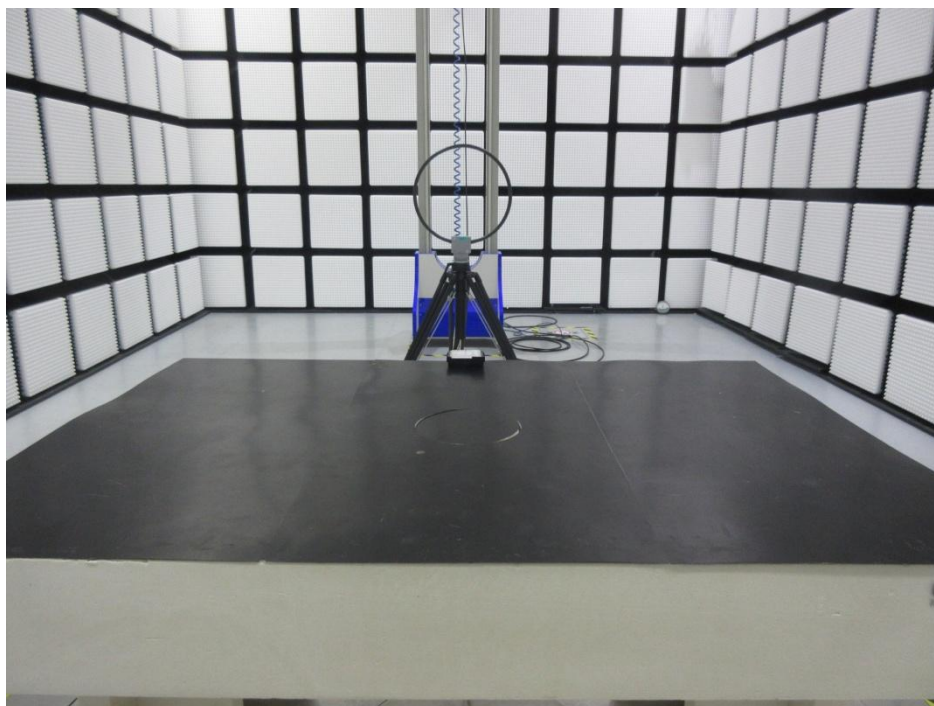
For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty

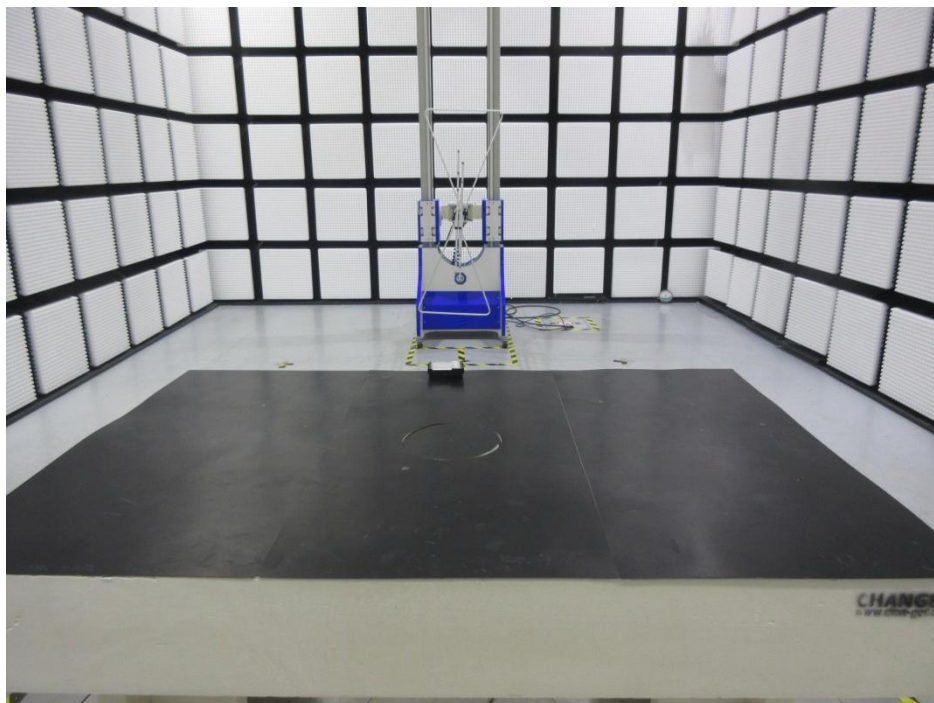
Items	Extended Uncertainty
Radiated spurious emission	U=±4.54dB (9KHz~30MHz)
	U=±4.91dB (30MHz~1GHz)
	U=±4.89dB (1GHz~18GHz)

13 Appendix A – Setup Photos

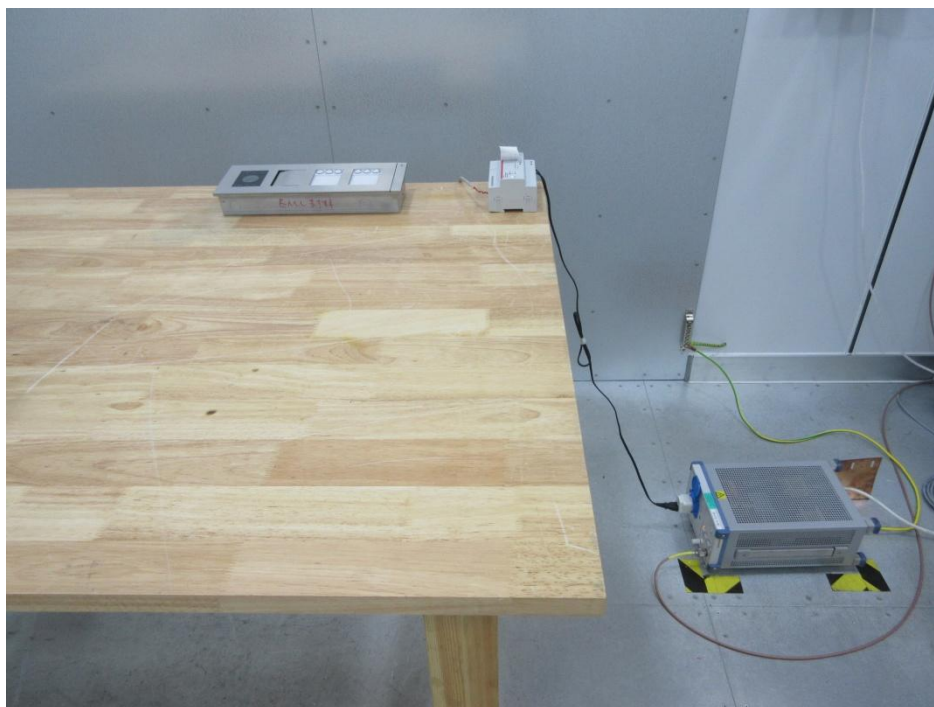
Setup photo of radiated emission (9KHz-30MHz)



Setup photo of radiated emission (30MHz-1GHz)



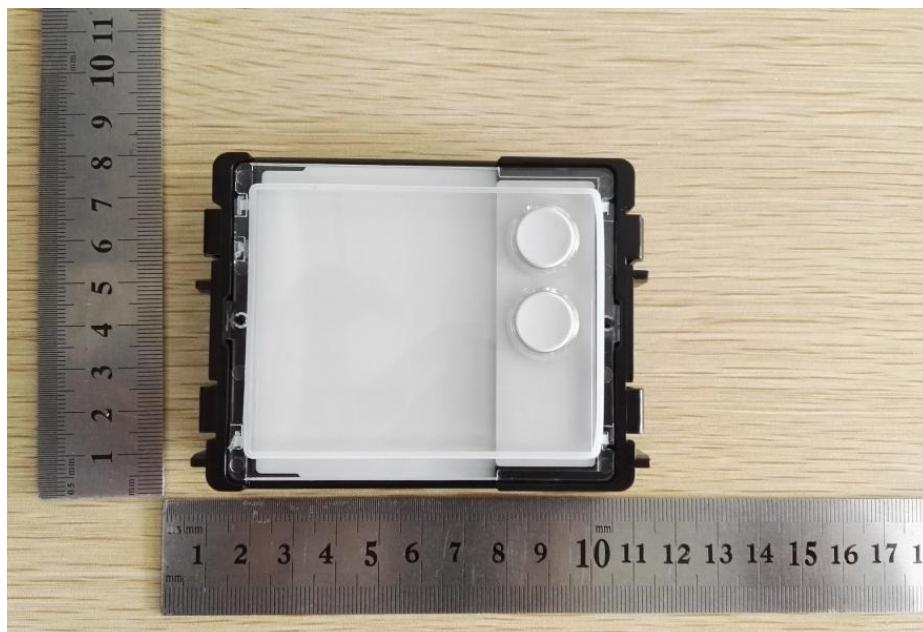
Setup photo of conducted emission (150KHz-30MHz)



14 Appendix B – EUT Photos

External photos

Front View



Back view

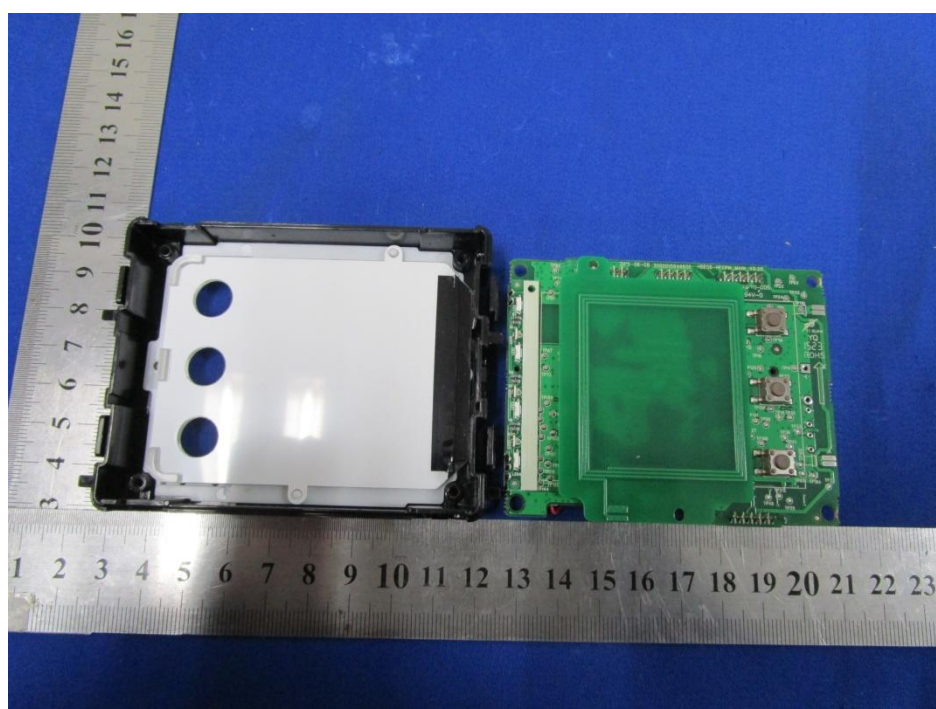
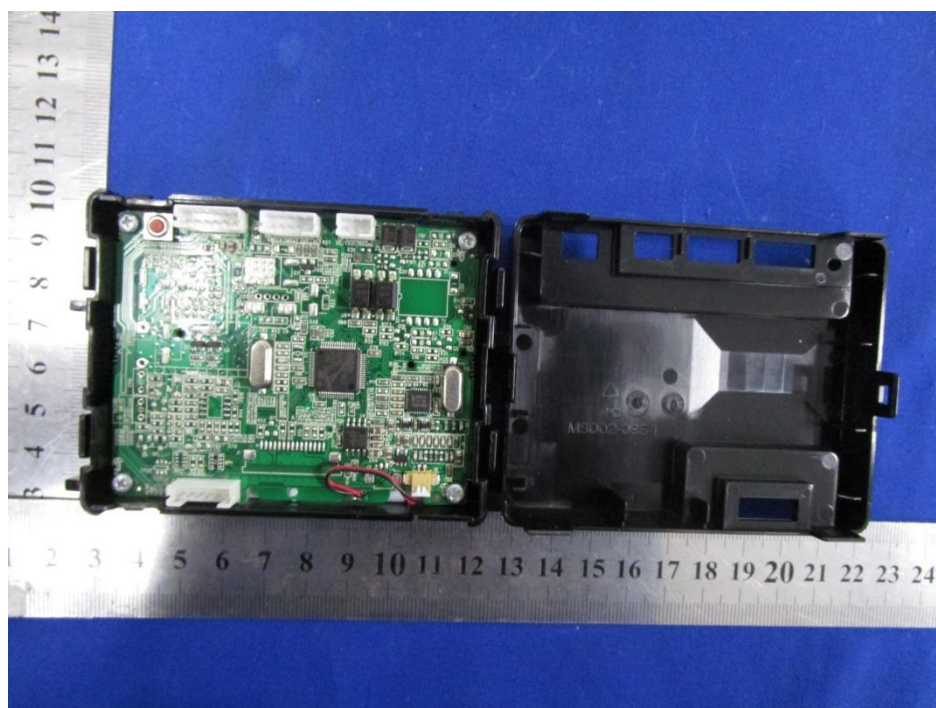


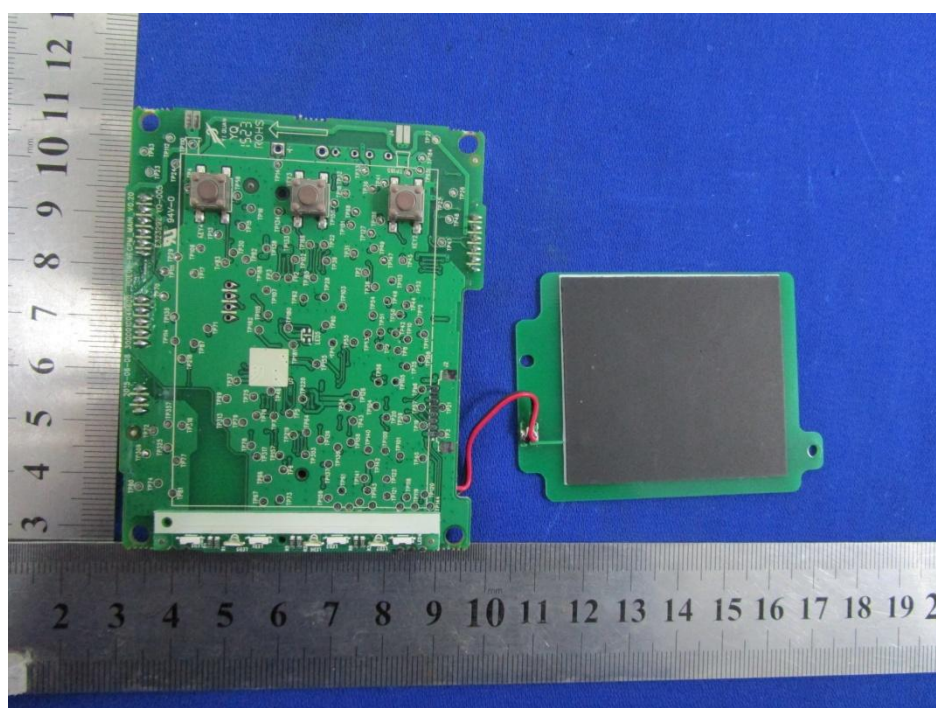
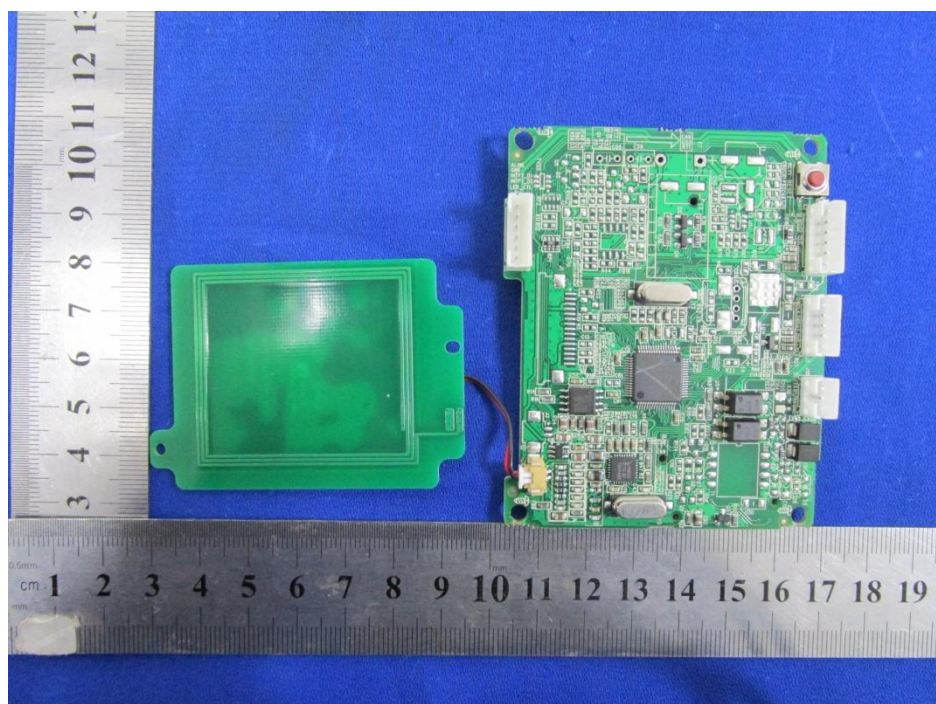
Side view

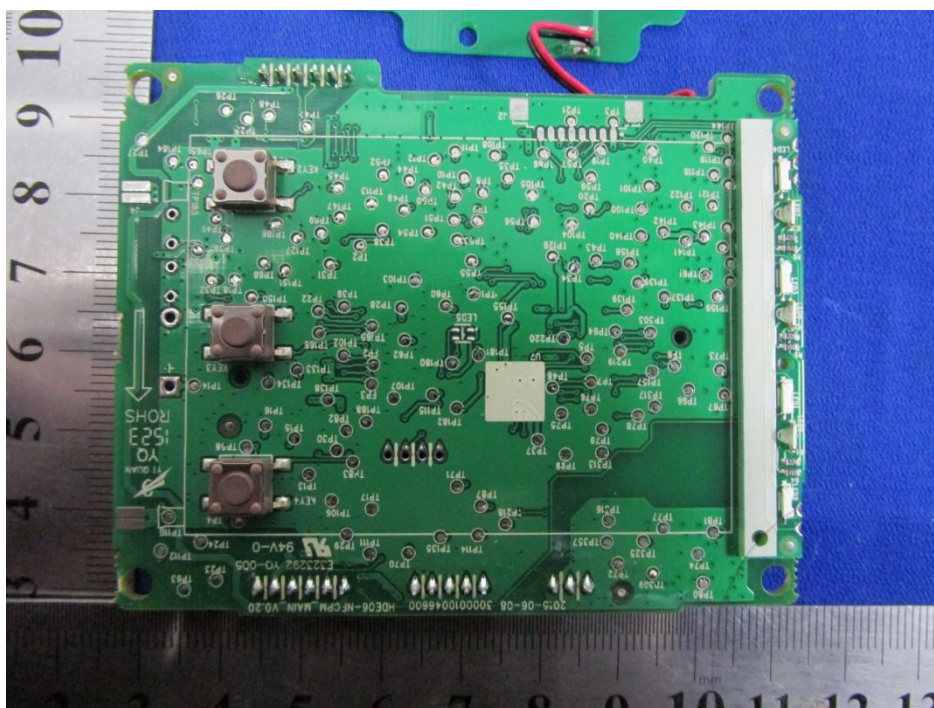
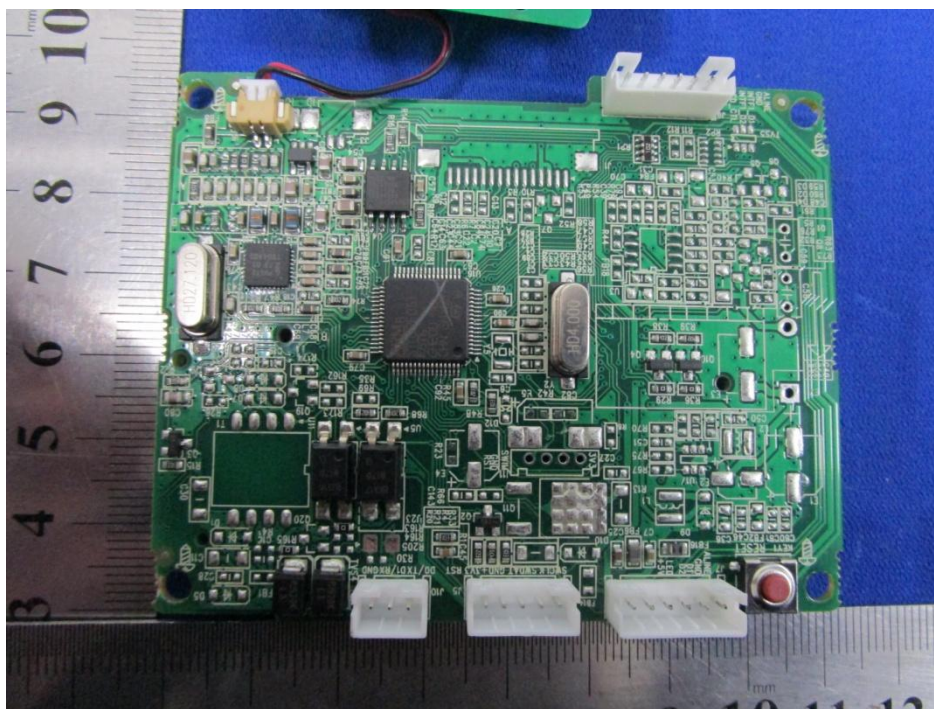




Internal photos







Antenna photo

