FCC - TEST REPORT

Report Number	:	**64.790.15.00706.01**	Date of Issue:	2015-03-24

Model	:	M251021CR
Product Type	:	Display module with ID 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	:	24	

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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

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3 Description of the Equipment Under Test

Product:	Display module with ID card reader
Model no.:	M251021CR
FCC ID:	2AEBL- M251021CR
Brand Name:	ABB
Options and accessories:	N/A
Rating:	Input: DC 5V
RF Transmission Frequency:	125KHz
Modulation:	ASK
Antenna Type:	Coil antenna
Description of the EUT:	EUT is a card reader, it can be grouped with other modules to act as a part of door entry system.

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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			
§15.209, 15.205	RSS-210 Issue 8 section 2 RSS-Gen Issue 4 clause 2.5	Filed Strength Measurement	13	1	P
§15.215(c)	RSS-Gen Issue 4 clause 6.6	Occupied Bandwidth	15	1	P

Note 1: N/A=Not Applicable.

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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: 2015-03-15

Testing Start Date: 2015-03-18

Testing End Date: 2015-03-31

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Reviewed by: EMC Project Manager

Tony Liu

Prepared by: EMC Project Engineer

Storm Shu

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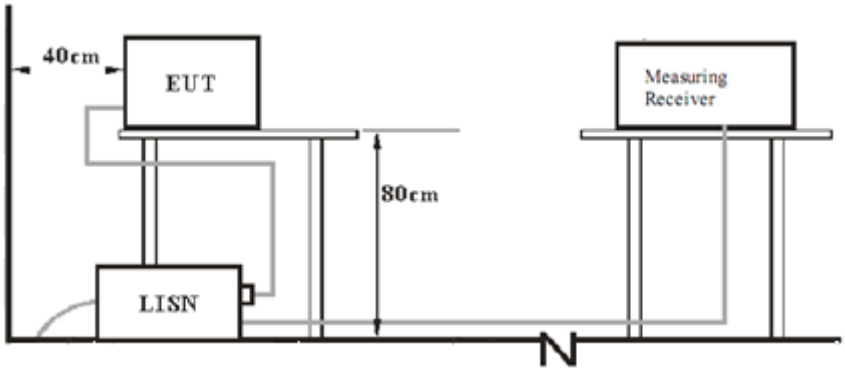
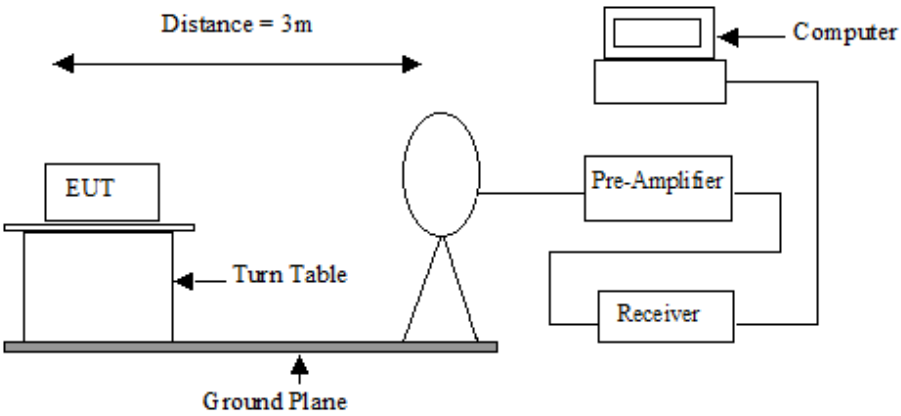
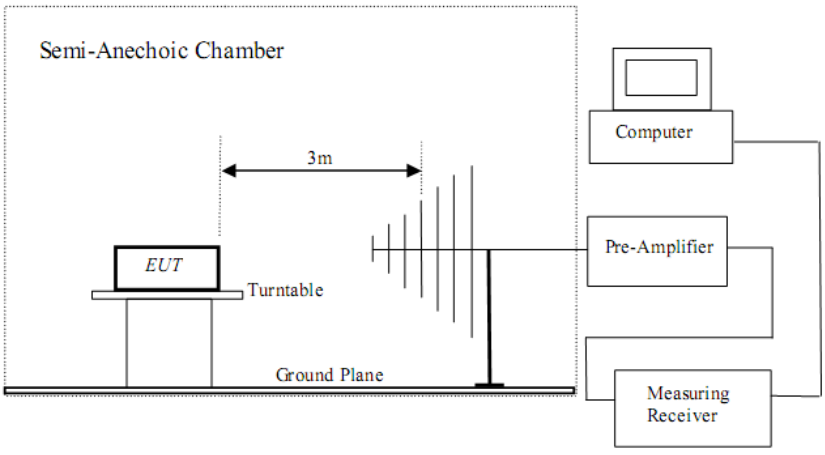
7 Test Setups

7.1 AC Power Line Conducted Emission test setups

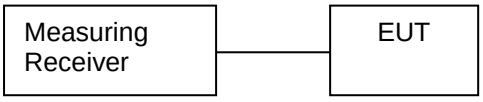


7.2 Radiated test setups





7.3 Conducted RF test setups



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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 + System Factor
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.

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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
Keypad module	ABB	M251021K-.	Input: 20-30 V d.c., 0.5W
Nameplate module	ABB	51021DN	Input: 20-30 V d.c., 0.25W

Remark: All the auxiliary equipments are used to make this “Display module with ID card reader” works as its representative configuration for conducted emission test.

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10 Technical Requirement

10.1 Conducted Emission Measurement

Test Requirement: FCC part 15 section 15.207
RSS-Gen Issue 4 clause 8.8

Limits of 15.207:

Frequency (MHz)	Conducted limit(dBμV)	
	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: 2015-03-31
Mode of Operation: Test EUT in a representative configuration that can read card.
Detector Function Quasi-peak and Average

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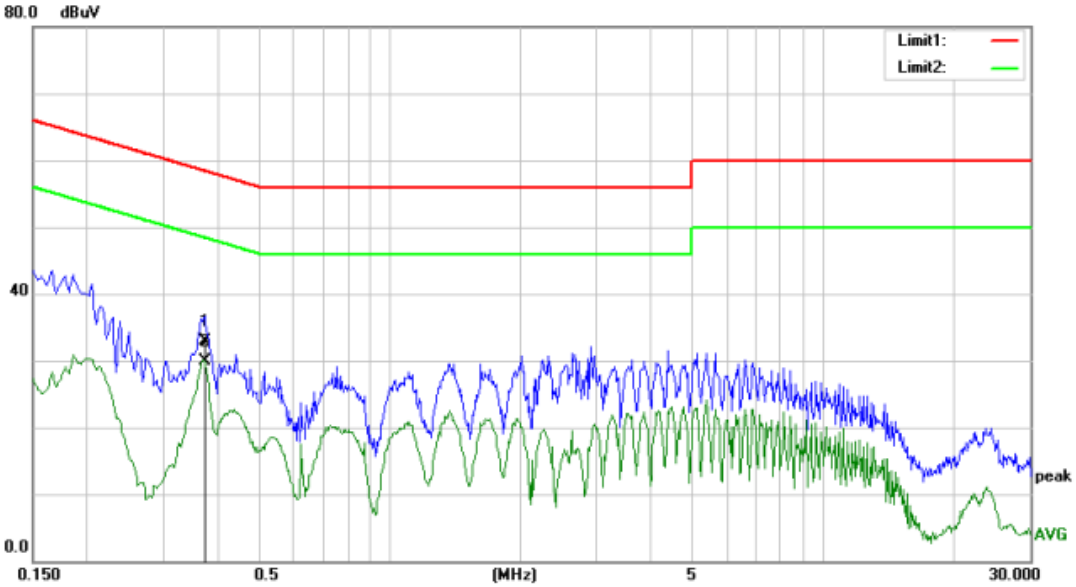
Test data:

Conducted emission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.3740	26.39	6.51	32.90	58.41	-25.51	QP
2	*	0.3740	23.49	6.51	30.00	48.41	-18.41	AVG

Operating Mode : Test EUT in a representative configuration with reading card.
Conduct Line/Port : L
Test By : Storm Shu
Test Date : 2015-03-31

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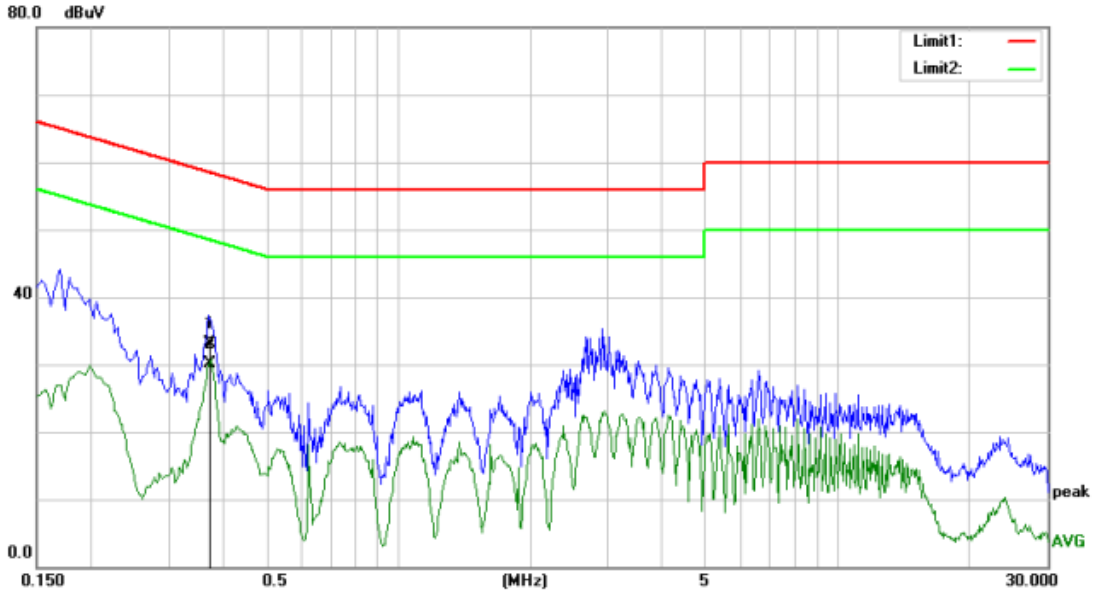
Conducted emission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.3726	26.68	6.51	33.19	58.44	-25.25	QP
2	*	0.3726	23.65	6.51	30.16	48.44	-18.28	AVG

Operating Mode	:	Test EUT in a representative configuration with reading card.
Conduct Line/Port	:	N
Test By	:	Storm Shu
Test Date	:	2015-03-31

Test result: PASS

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10.2 Filed Strength Measurement

Test Requirement: FCC part 15 section 15.209, 15.205 &
RSS-210 Issue 8 section 2,
RSS-Gen Issue 4 clause 8.9, 8.10

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: 2015-03-20
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)

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Test data:

Emission 9KHz-30MHz

Frequency (MHz)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB)	Remark
0.121330	46.6	125.92	79.32	H	20.0	Peak
0.122364	52.2	125.84	73.64	H	20.0	Peak
0.122928	54.08	125.8	71.72	H	20.0	Peak
0.123962	54.16	125.73	71.57	H	20.0	Peak
0.124479	62.27	125.7	63.43	H	20.0	Peak
0.124996	67.81	125.66	57.85	H	20.0	Peak
0.125560	62.47	125.62	63.15	H	20.0	Peak
0.126077	55.03	125.58	70.55	H	20.0	Peak
0.127111	54.52	125.51	70.99	H	20.0	Peak
0.127628	52.4	125.48	73.08	H	20.0	Peak
0.129179	46.81	125.37	78.56	H	20.0	Peak
0.159046	48.07	123.57	75.50	H	19.9	Peak
0.376136	49.29	116.1	66.81	H	19.9	Peak
0.624886	35.87	71.69	35.83	H	19.9	QP
13.252341	42.28	69.50	27.22	H	20.0	QP
13.501091	44.51	69.50	24.99	H	20.0	QP

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB)	Remark
0.120014	42.46	126.01	83.55	V	20.0	Peak
0.122975	41.12	125.8	84.68	V	20.0	Peak
0.123962	43.18	125.73	82.55	V	20.0	Peak
0.124479	50.99	125.7	74.71	V	20.0	Peak
0.124996	55.91	125.66	69.75	V	20.0	Peak
0.125560	50.82	125.62	74.80	V	20.0	Peak
0.126077	43.95	125.58	81.63	V	20.0	Peak
0.127111	42.2	125.51	83.31	V	20.0	Peak
0.127628	40.86	125.48	84.62	V	20.0	Peak
13.062386	31.51	69.50	37.99	V	20.0	QP
13.347318	33.57	69.50	35.93	V	20.0	QP

Test result: PASS

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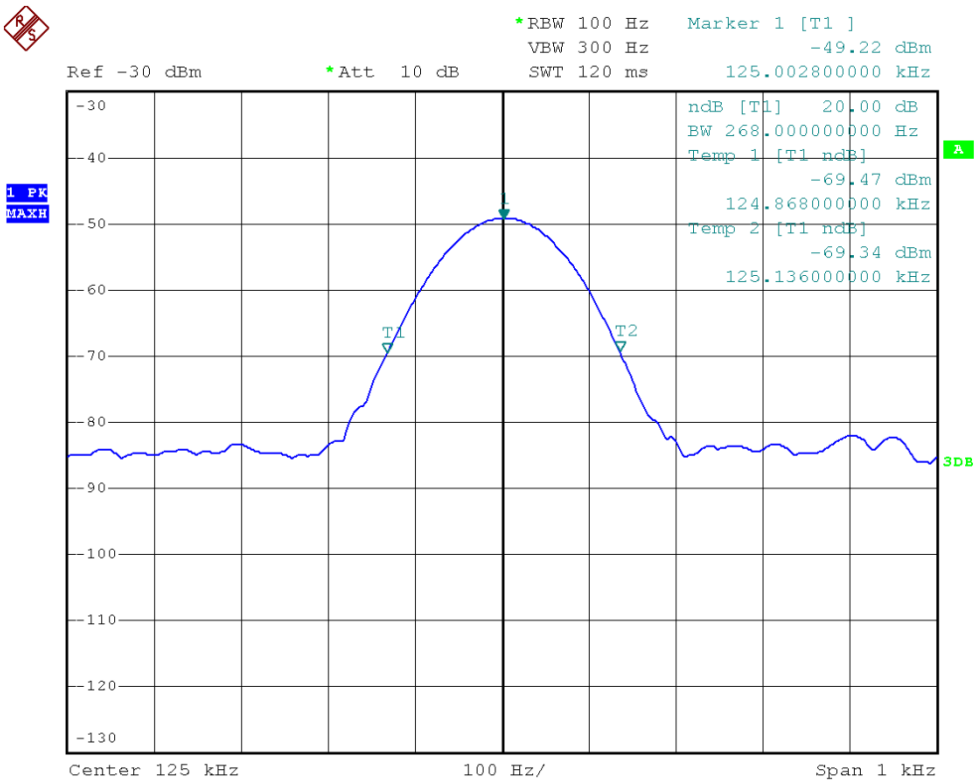
10.3 Occupied Bandwidth

Test Requirement:	FCC Part 15 C Section 15.215 (c) RSS-Gen Issue 4 clause 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:	2015-03-18
Mode of Operation:	Continuously transmitting mode.
Detector Function	Maxpeak
Measurement BW	RBW:100Hz VBW:300Hz

Test data:

20dB bandwidth



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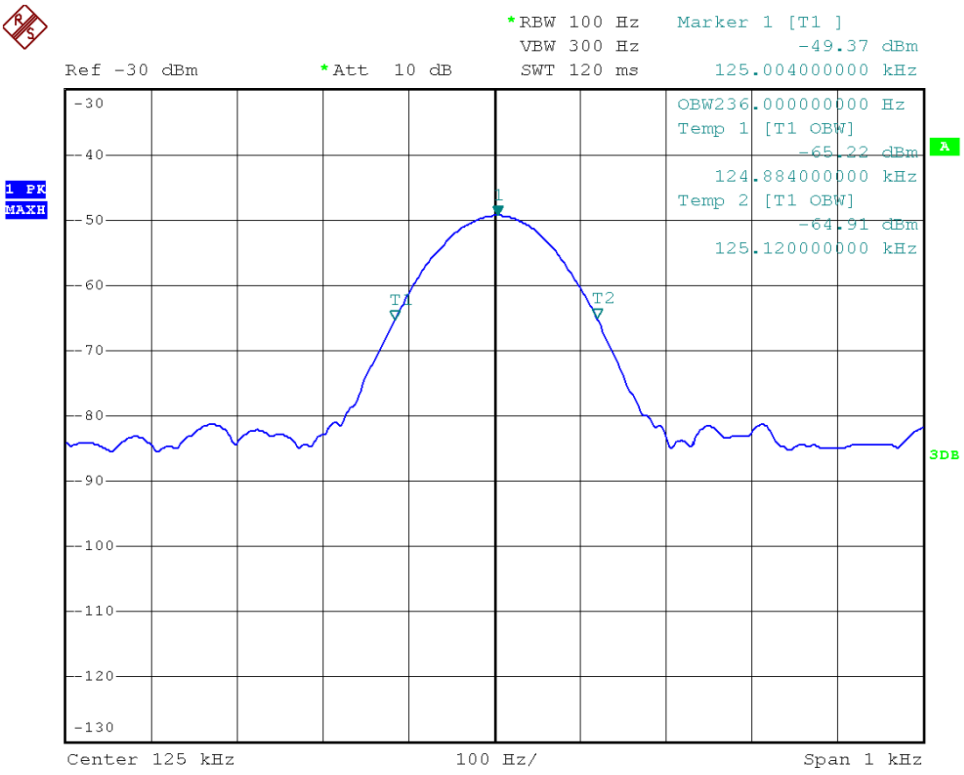
99% bandwidth



Result: PASS

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11 Test Equipment List

List of Test Instruments

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
C	Signal Analyzer	Rohde & Schwarz	FSV40	101031	2015-8-17
	Programmable temperature and humidity chamber	MHG-408CASI	TaiLi	A81002	2015-8-17
	DC power supply	INSTEK	GPR-30600	EH873394	N/A
CE	EMI Receiver	Rohde & Schwarz	ESCI	100529	2015-7-21
	L.I.S.N (single phase)	SCHWARZBECK	NSLK 8127	8127450	2015-8-21
RE	EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2015-8-17
	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100398	2017-8-17
	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）

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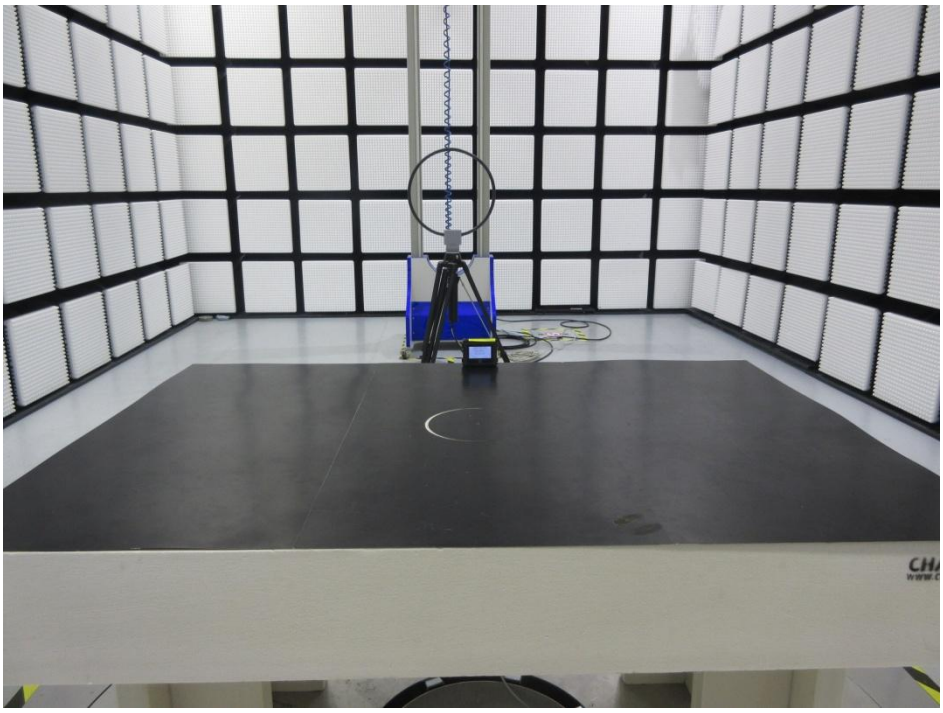
13 Appendix A – Setup Photos

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



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

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14 Appendix B – EUT Photos

External photos

Front View

Back view

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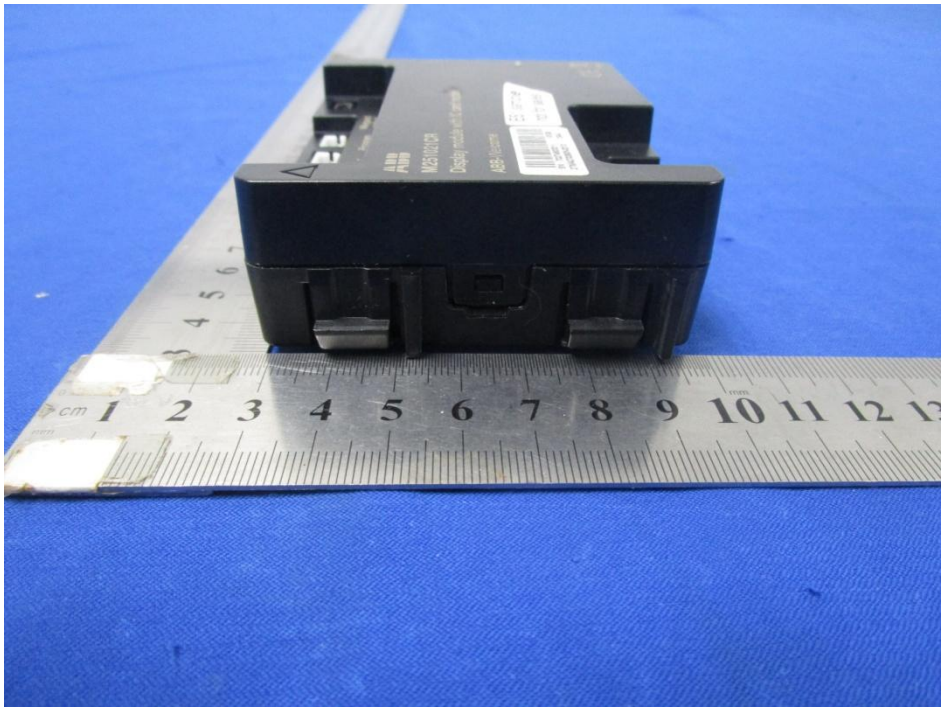
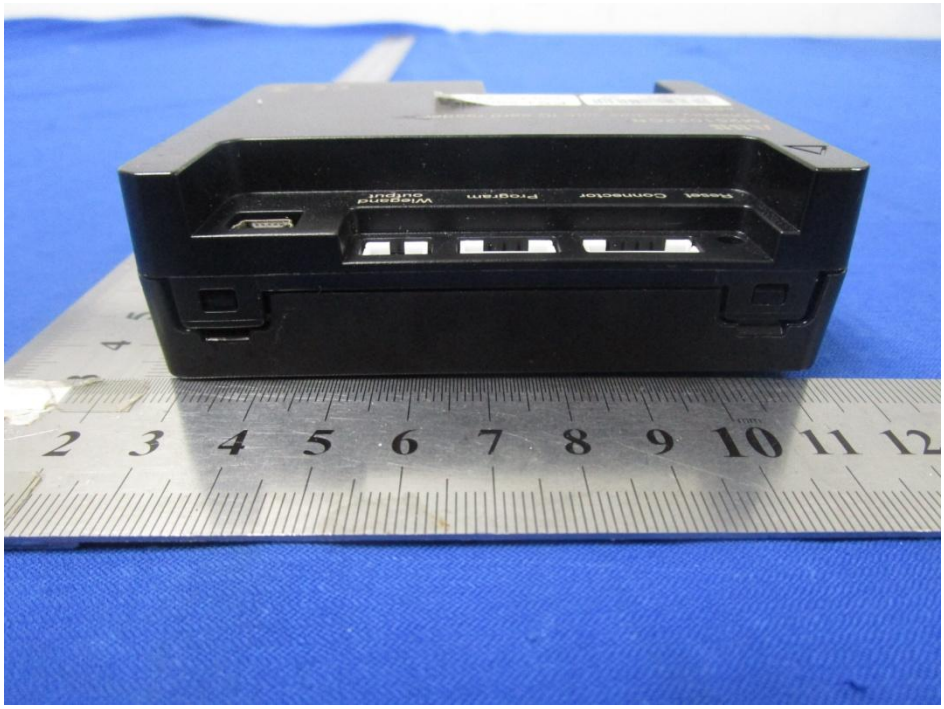
Side view





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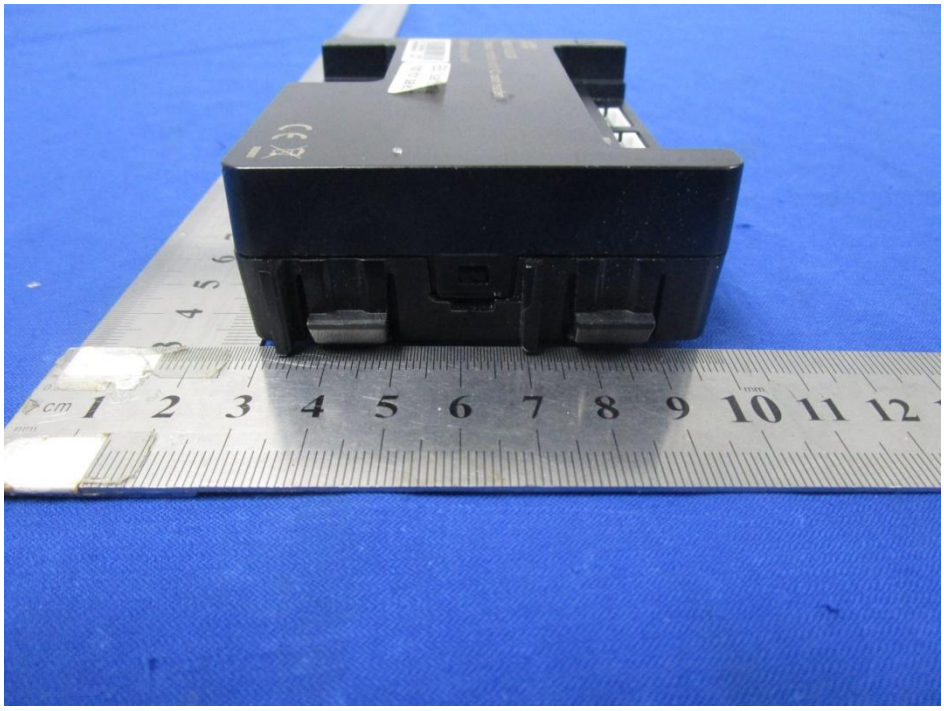

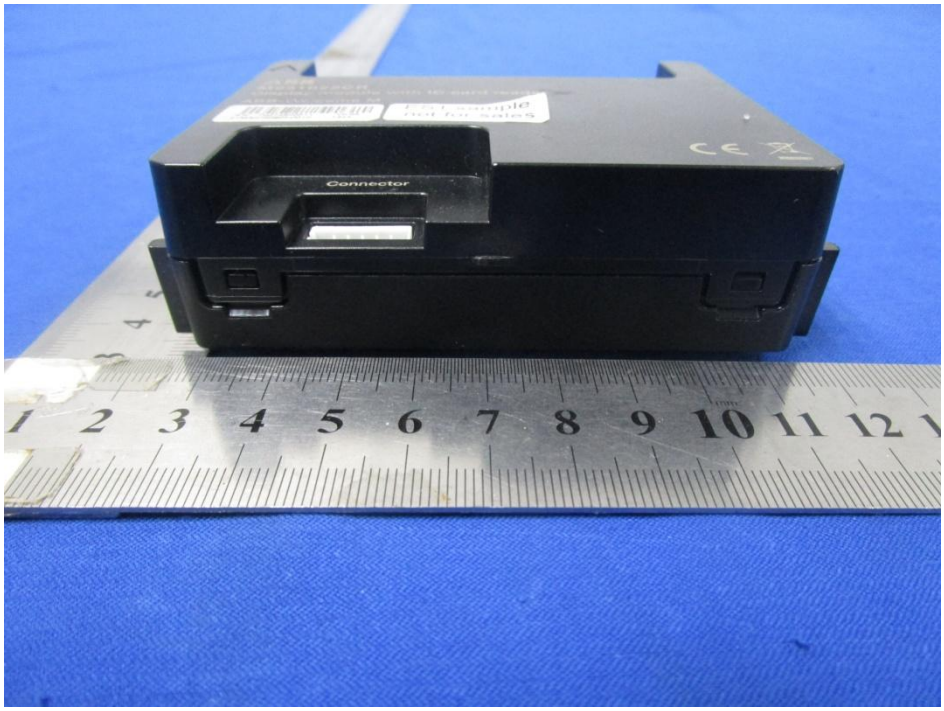

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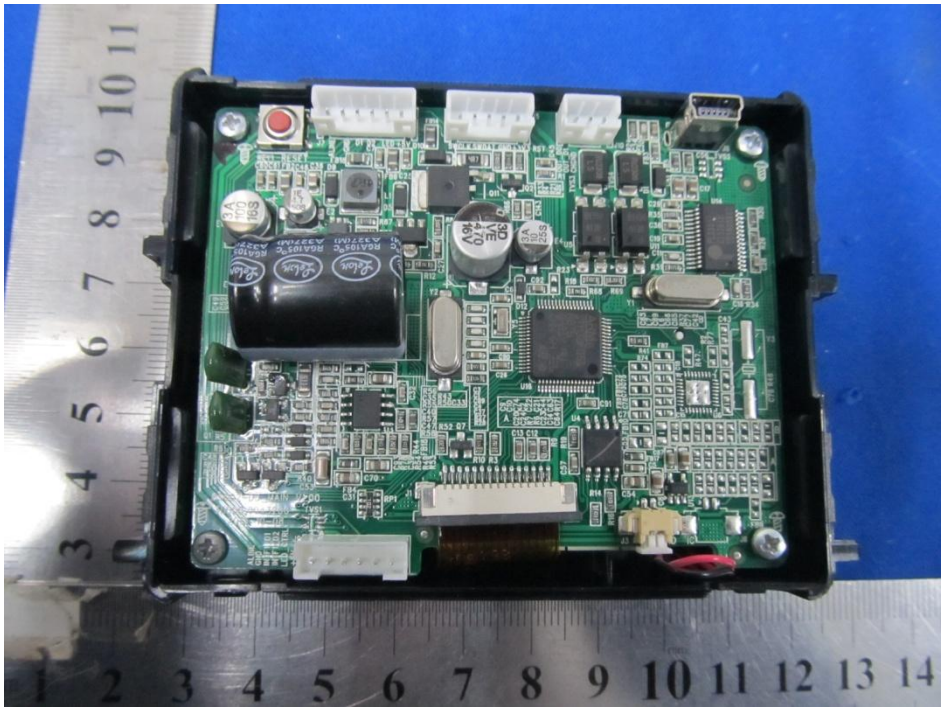
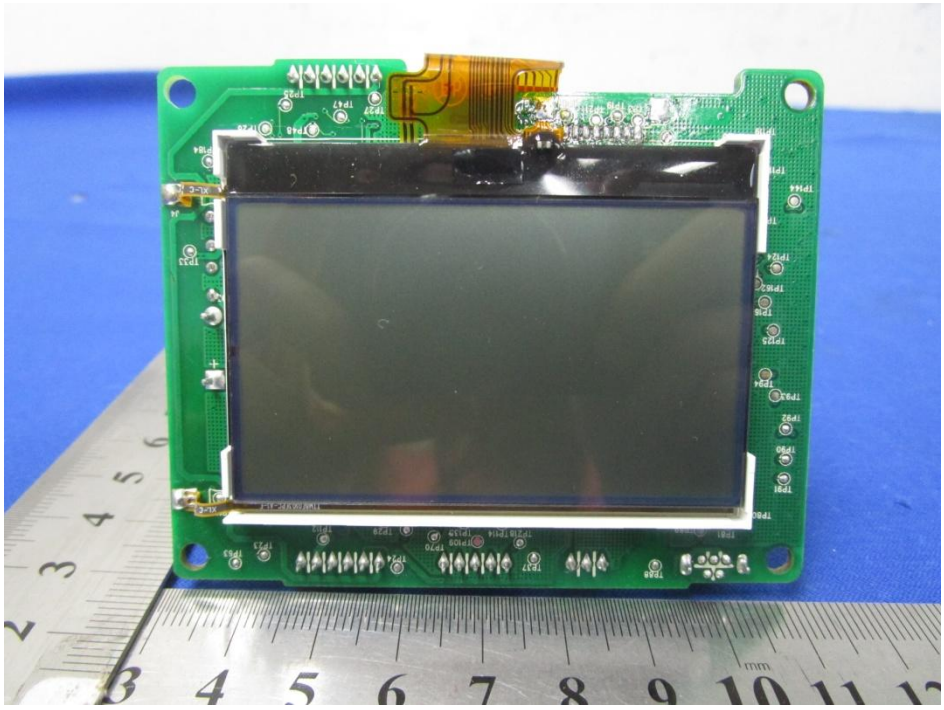
Internal photos





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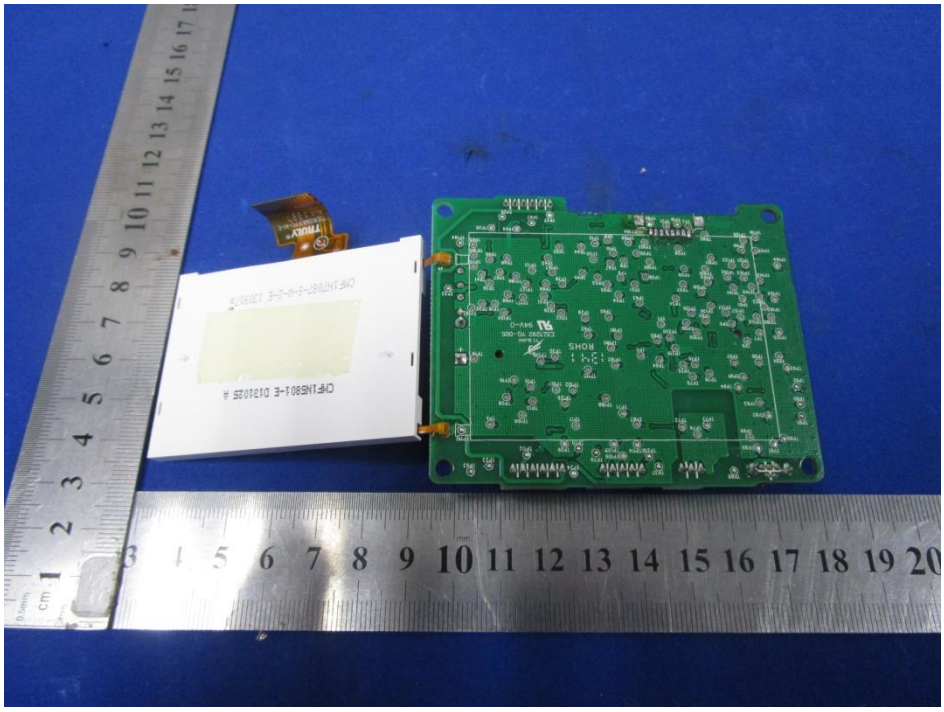

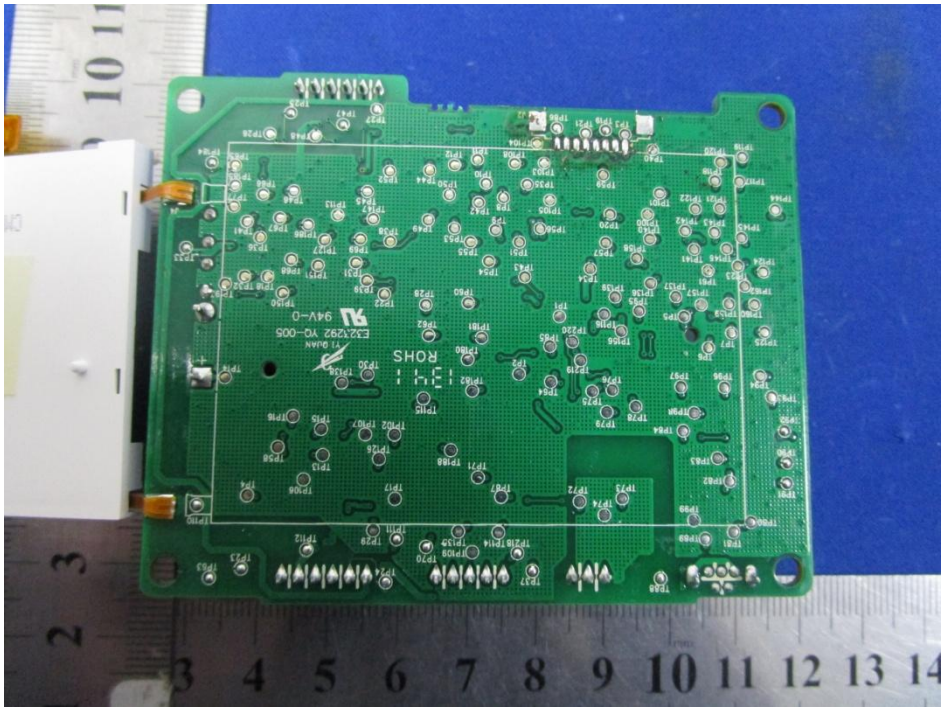

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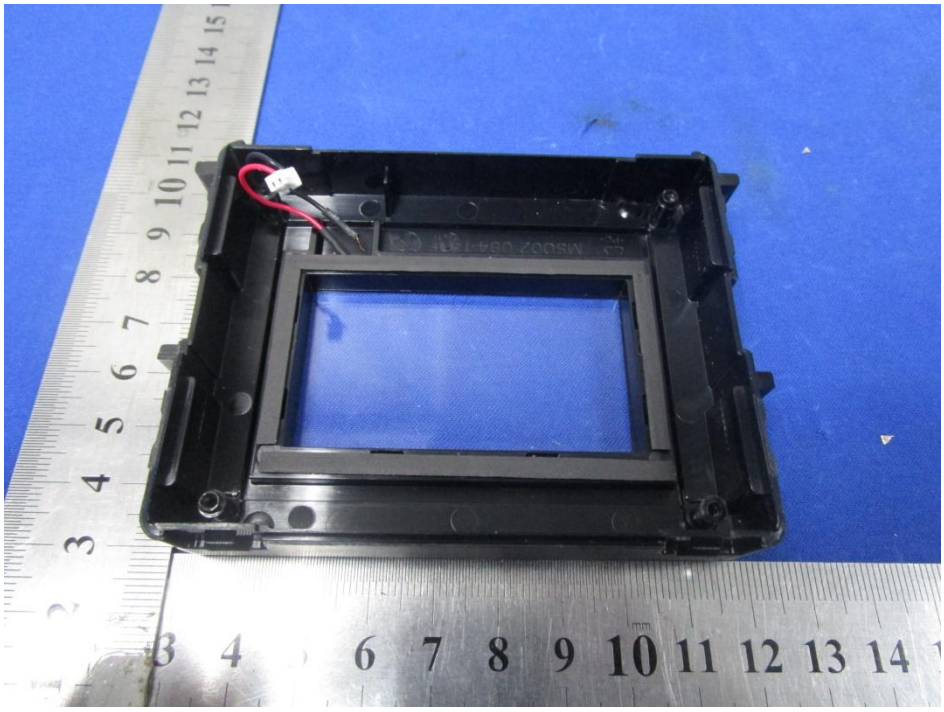
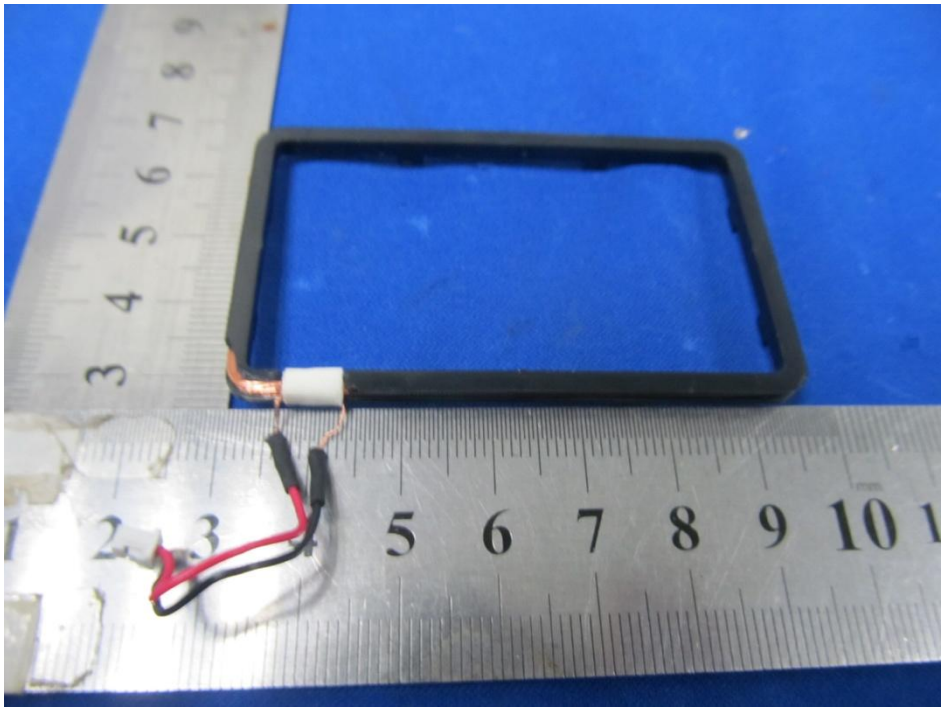


Antenna photo



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