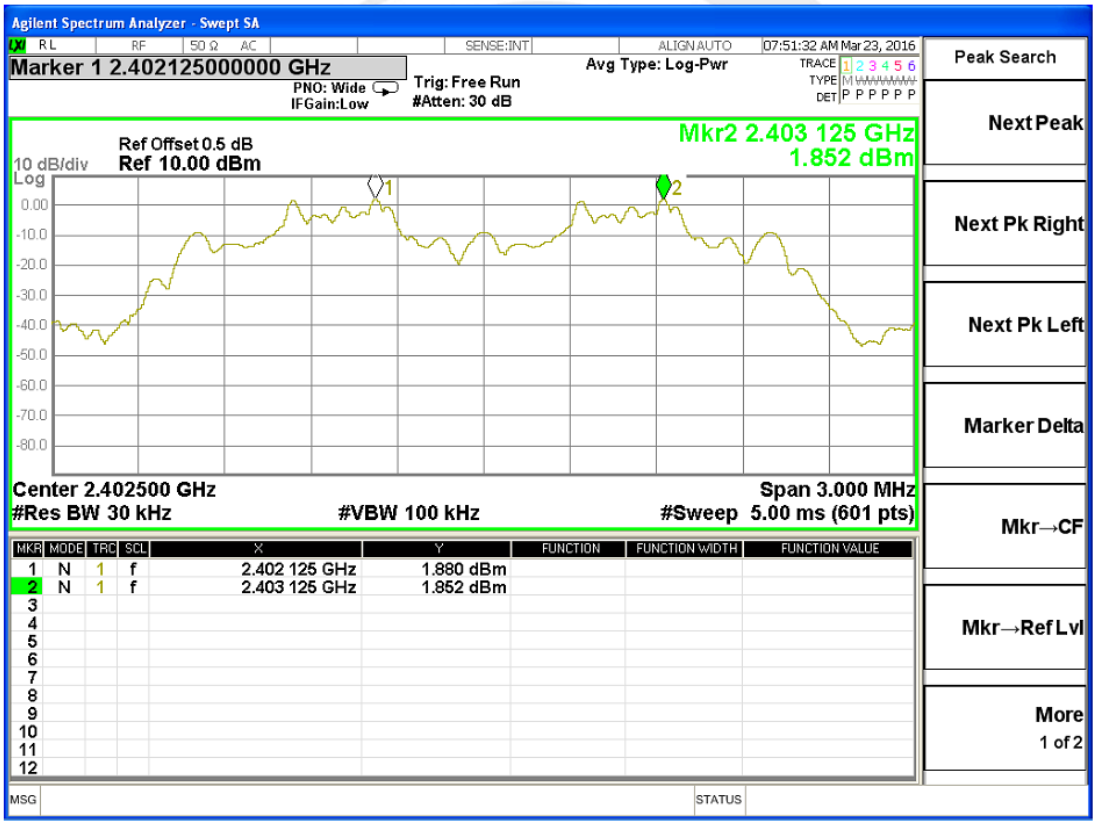
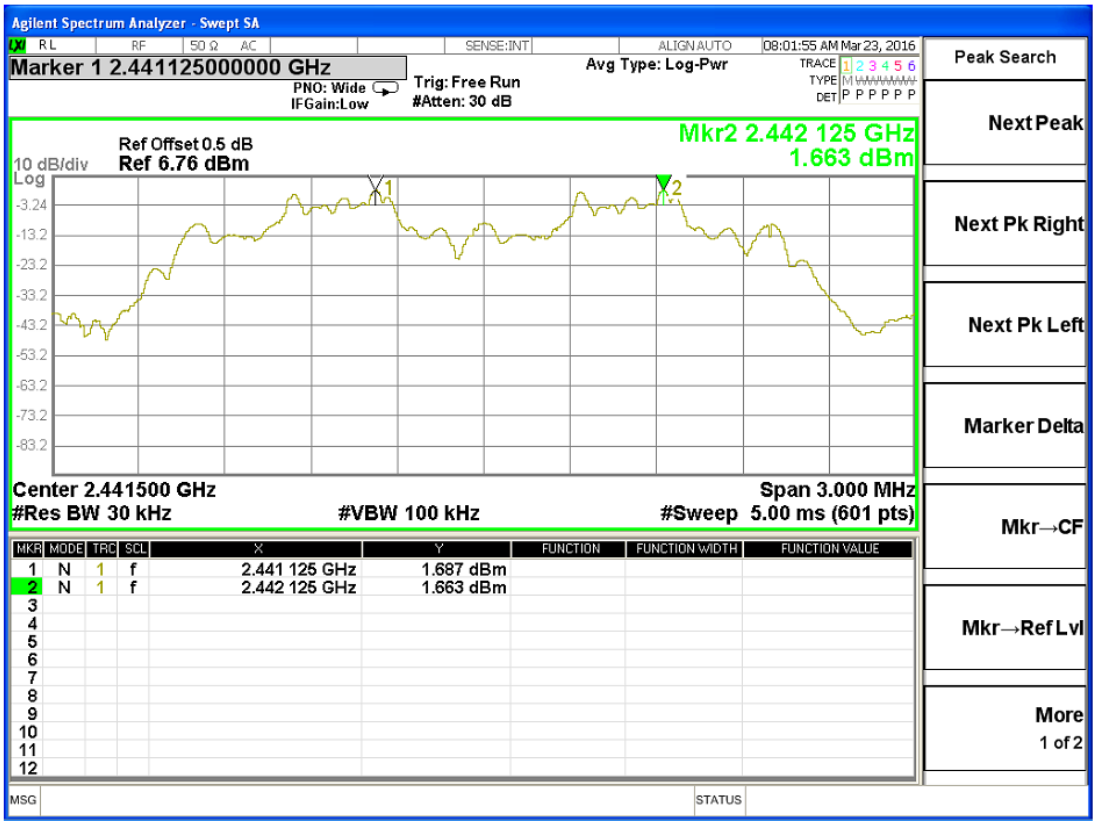
CH00 / CH39 /CH78 (π/4-DQPSK(2Mbps) Mode)

Frequency (MHz)	Ch. Separation (MHz)	20 dB BW (MHz)	2/3 20 dB BW (MHz)
2402	1.000	1.113	0.742
2441	1.000	1.113	0.742
2480	1.000	1.113	0.742
Note: Pass, forπ/4-DQPSK: Ch. Separation Limits: > two-thirds 20dB bandwidth.			

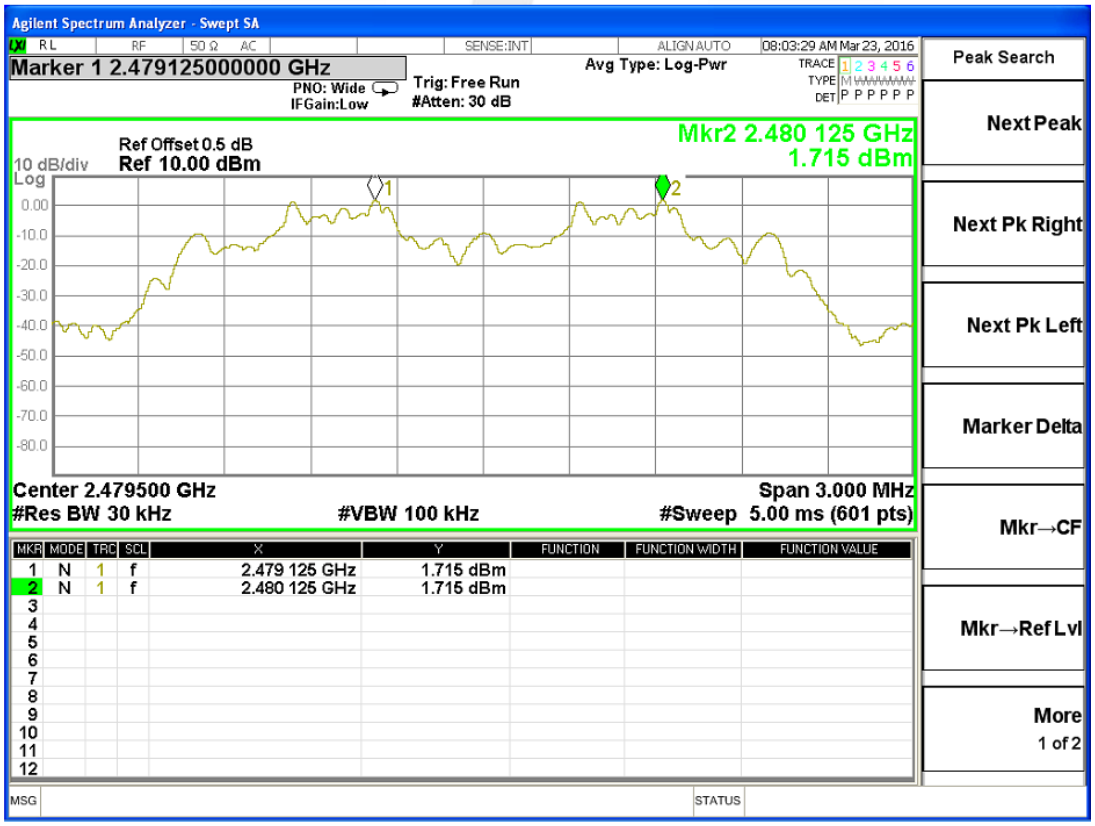
CH00 -2Mbps



CH39 -2Mbps



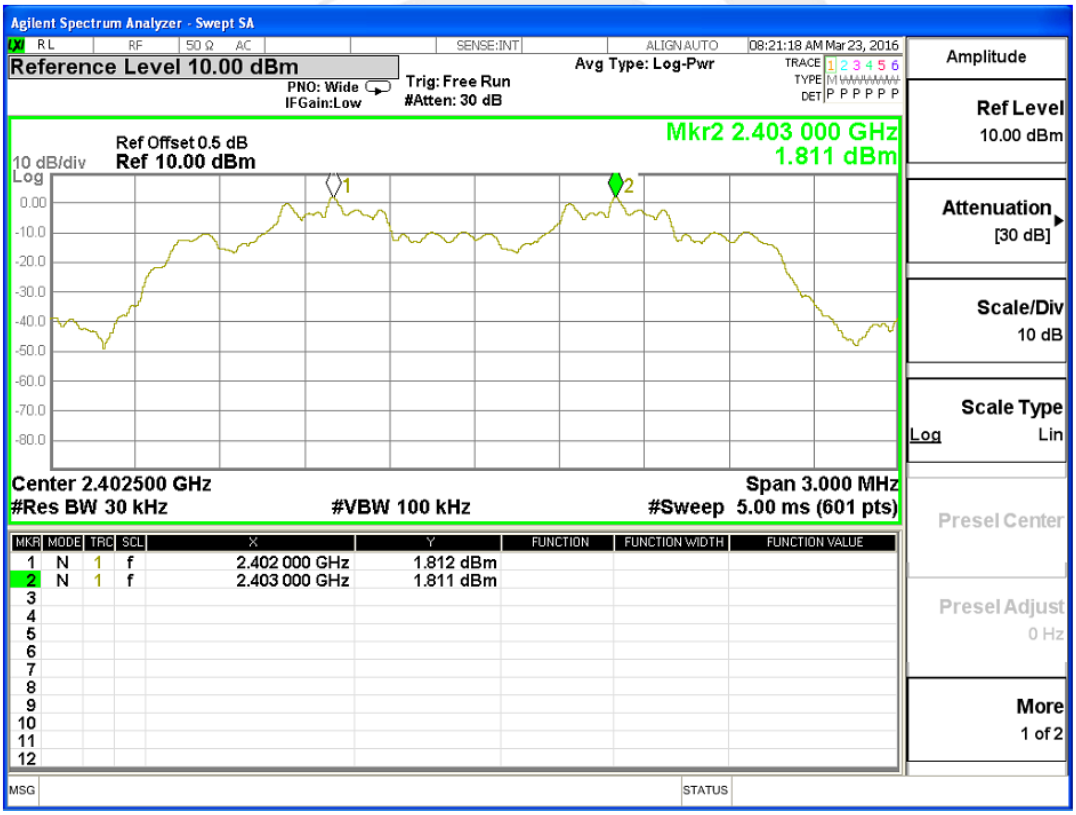
CH78 -2Mbps



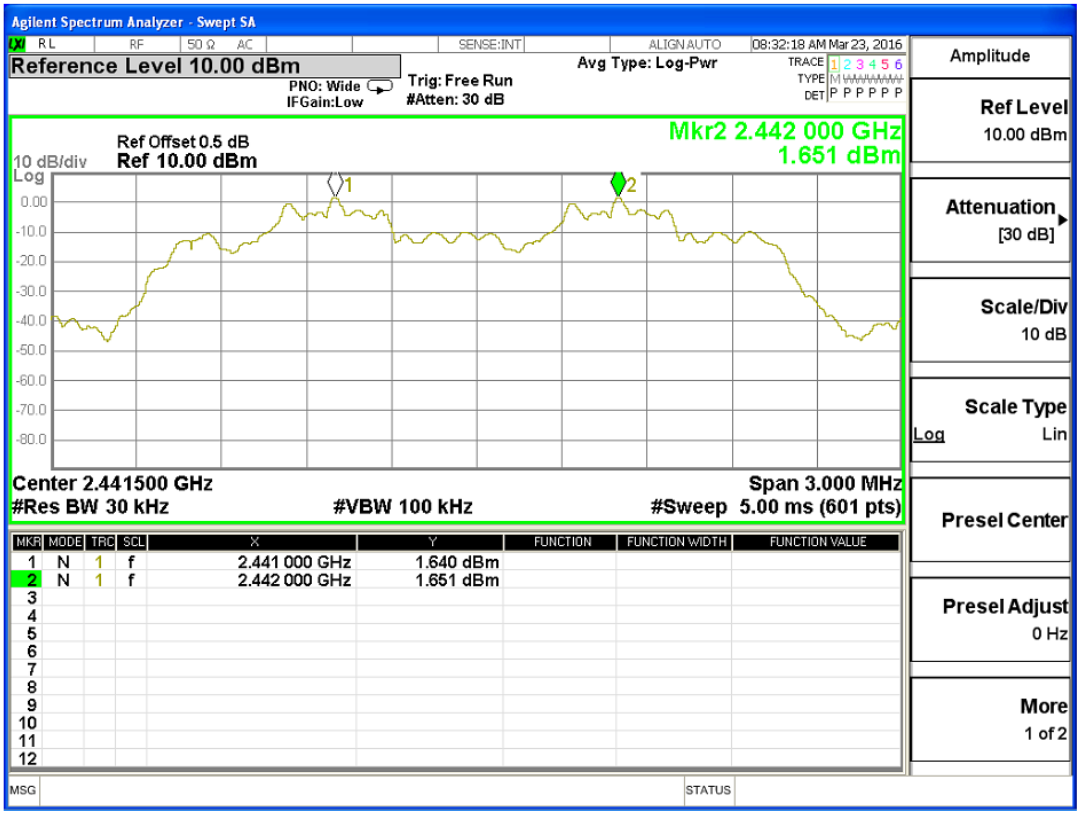
CH00 / CH39 /CH78 (8-DPSK(3Mbps)Mode)

Frequency (MHz)	Ch. Separation (MHz)	20 dB BW (MHz)	2/3 20 dB BW (MHz)
2402	1.000	1.161	0.774
2441	1.000	1.160	0.773
2480	1.000	1.161	0.774
Note: Pass, for 8-DPSK: Ch. Separation Limits: > two-thirds 20dB bandwidth.			

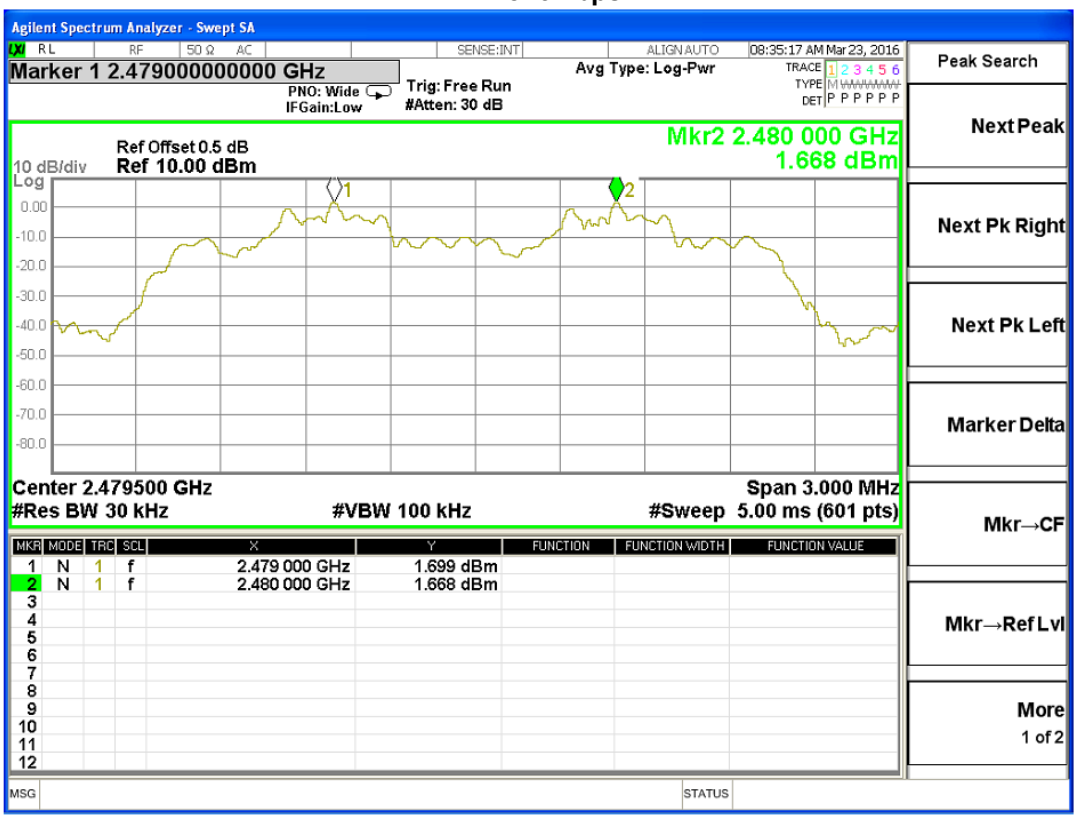
CH00 -3Mbps



CH39 -3Mbps



CH78 -3Mbps



3.9 Occupied Bandwidth

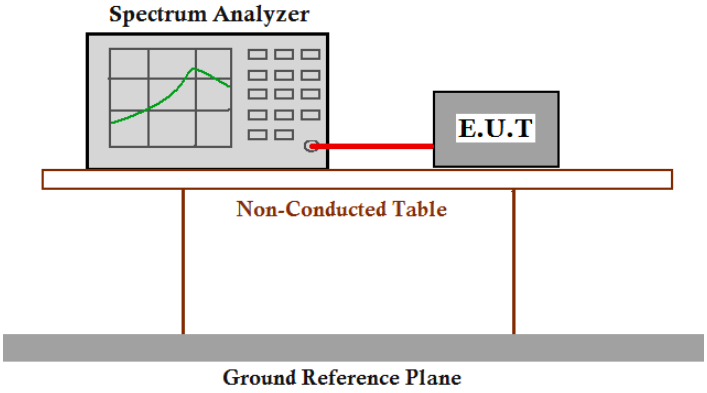
Test Requirement: FCC Part 15 C section 15.247

(a)(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Test Method: ANSI C63.10: Clause 6.9 & DA 00-705

Test Status: Pre-test the EUT in continuous transmitting mode at the lowest (2402 MHz), middle (2441 MHz) and highest (2480 MHz) channel with different data package. Compliance test in hopping GFSK(1Mbps), π/4-DQPSK(2Mbps), 8-DPSK(3Mbps) modes.

Test Configuration:



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: Span = approximately 2 to 3 times the 20dB bandwidth, centring on a hopping channel;
3. Set the spectrum analyzer: RBW >= 1% of the 20dB bandwidth VBW >= RBW. Sweep = auto; Detector Function = Peak. Trace = Max Hold.
4. Mark the peak frequency and -20dB points bandwidth.

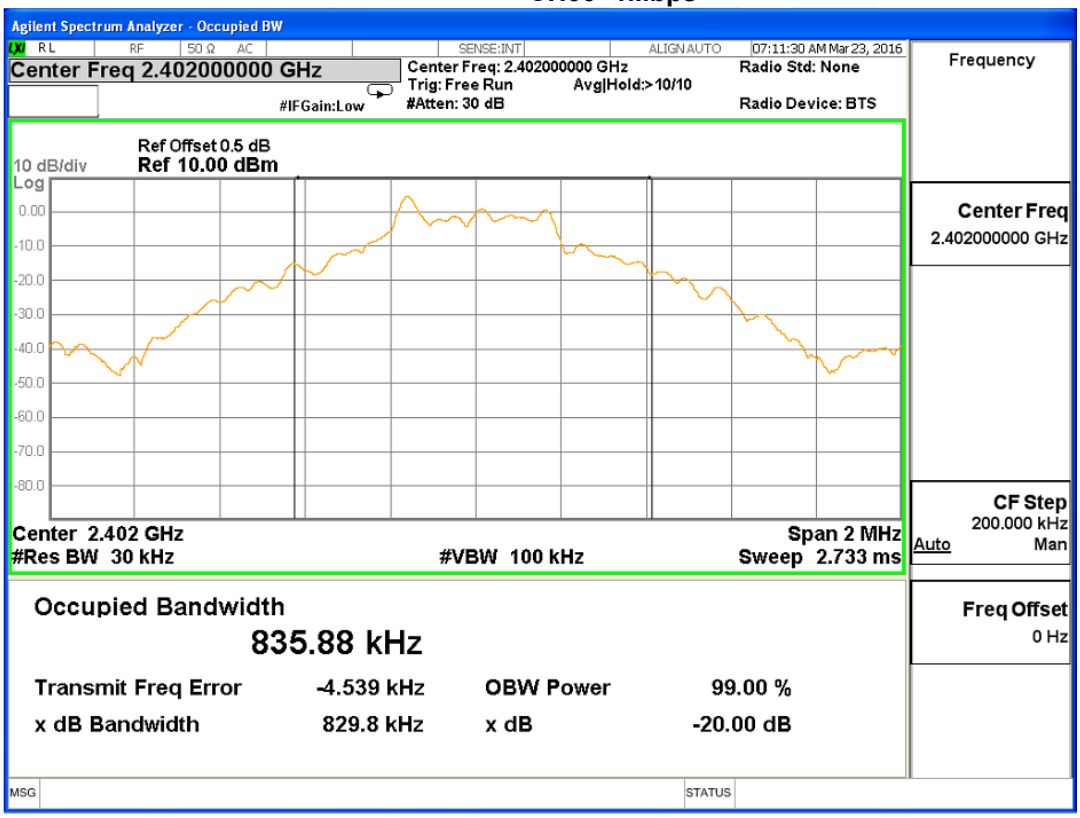
Test result:

Test result:

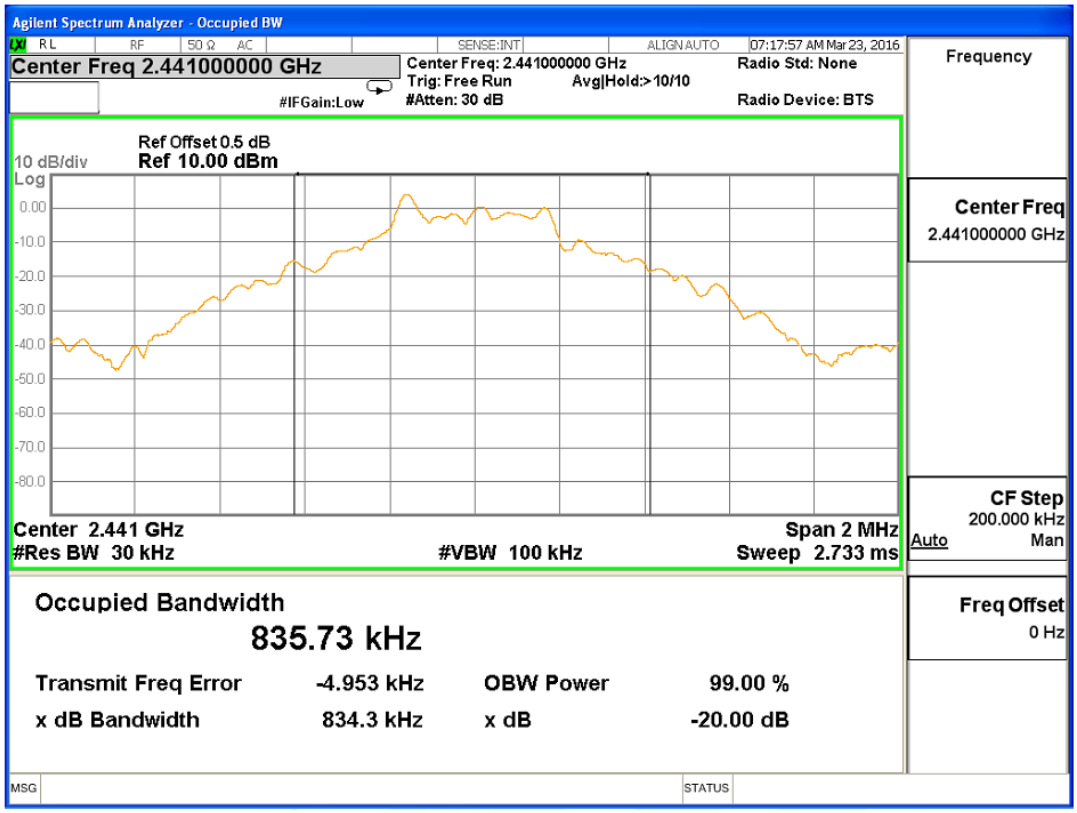
CH00 / CH39 /CH78 (GFSK(1Mbps) Mode)

Frequency (MHz)	20 dB BW (MHz)
2402	0.830
2441	0.834
2480	0.835

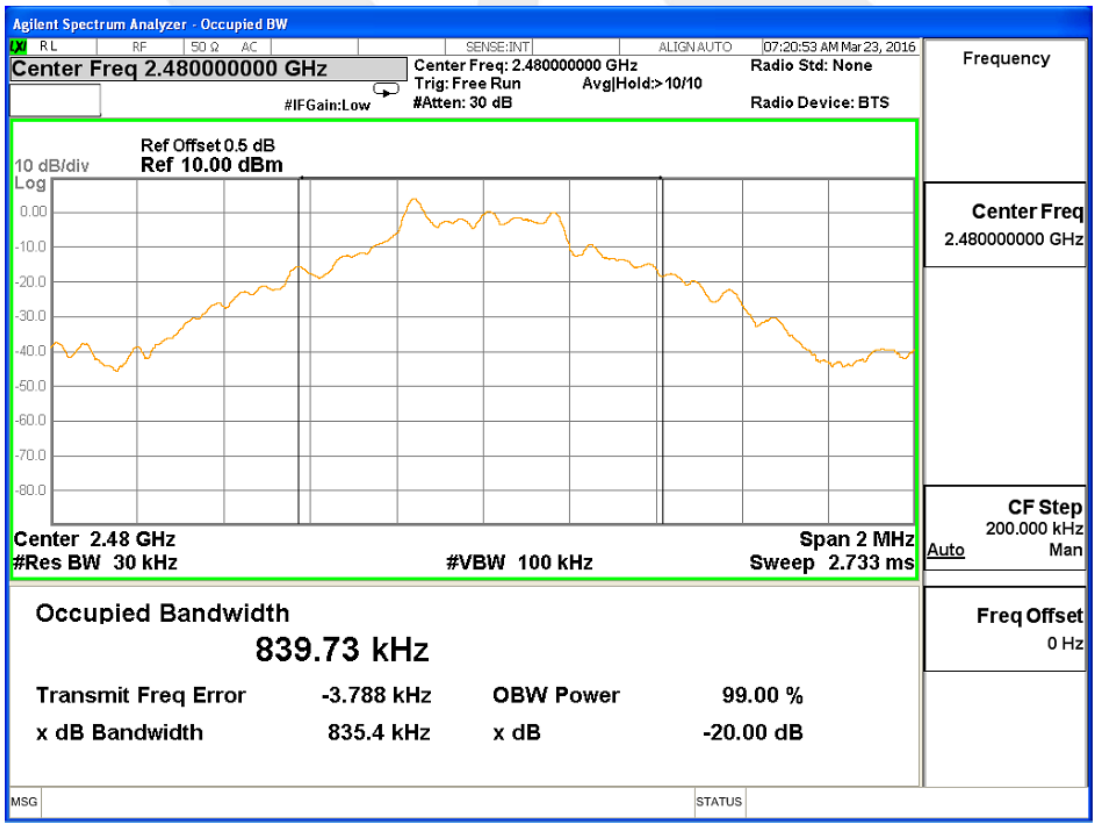
CH00 -1Mbps



CH39 -1Mbps



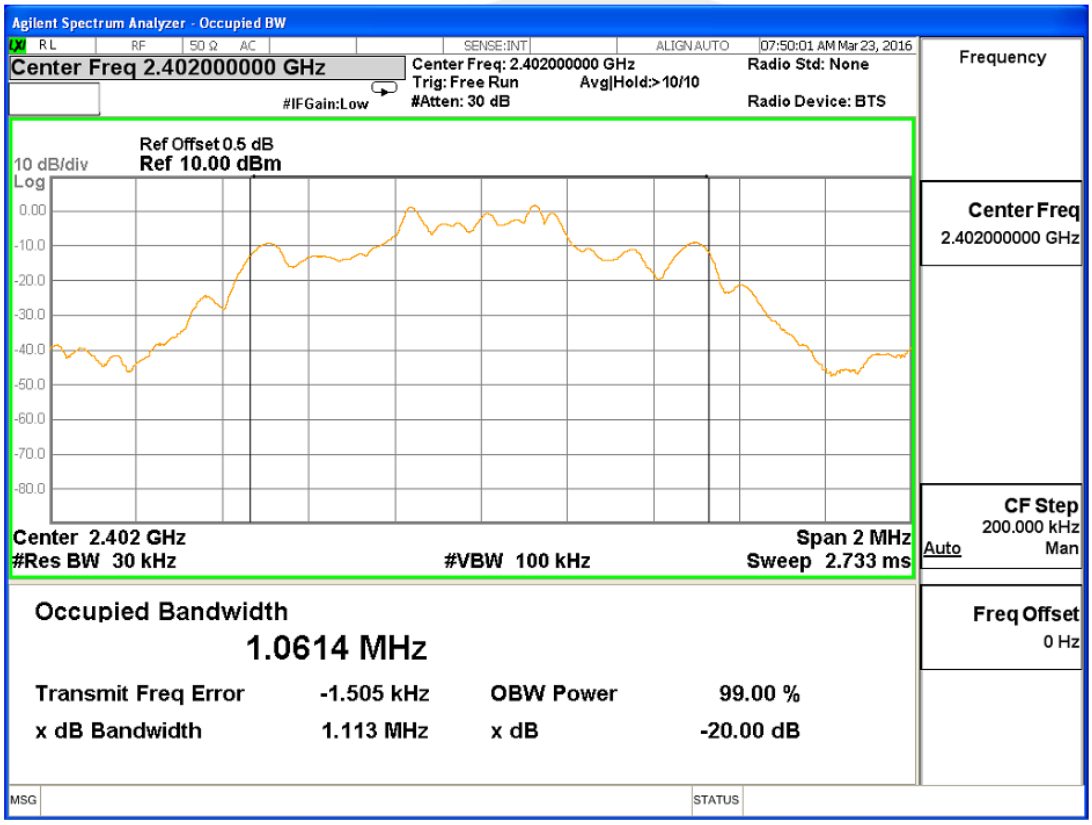
CH78 -1Mbps



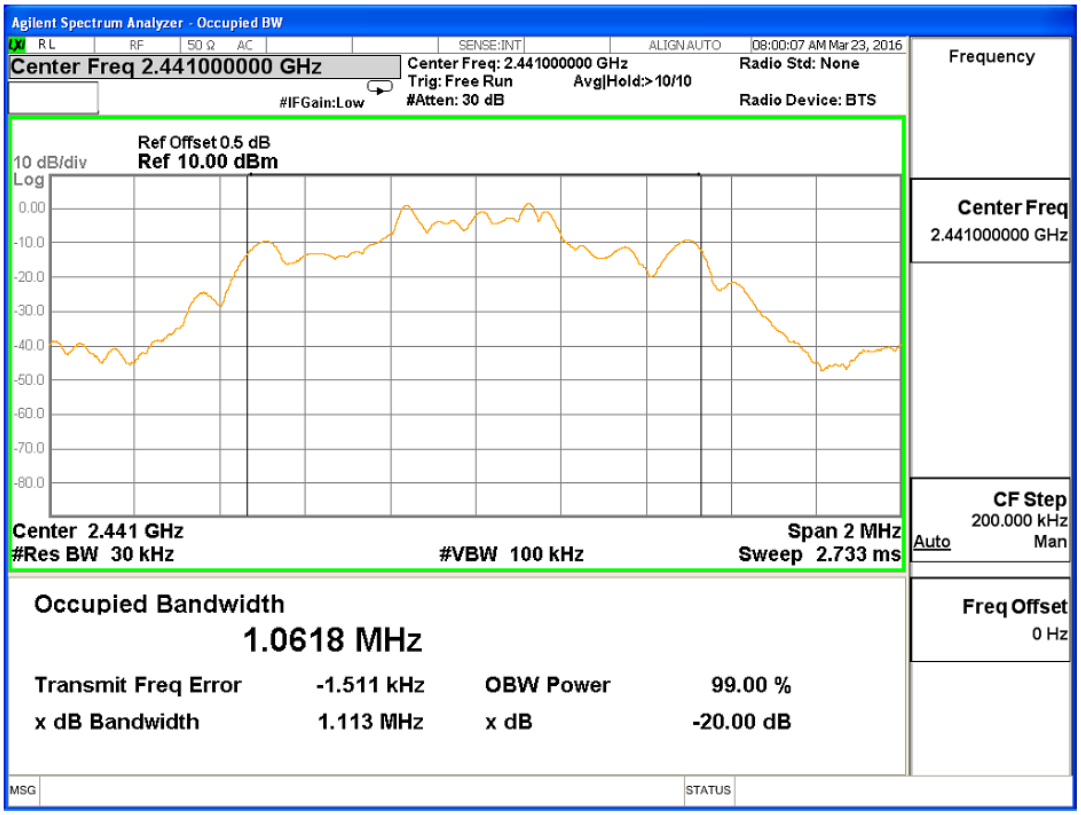
CH00 / CH39 /CH78 (π/4-DQPSK(2Mbps) Mode)

Frequency (MHz)	20 dB BW (MHz)
2402	1.113
2441	1.113
2480	1.113

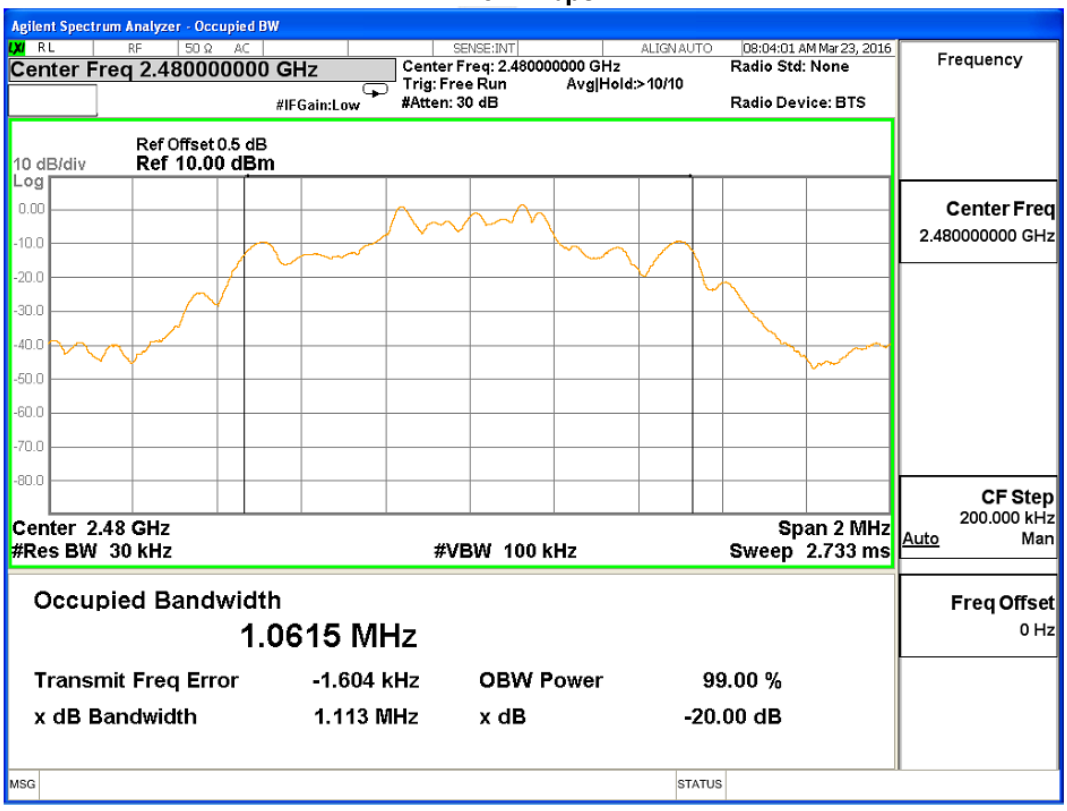
CH00 -2Mbps



CH39 -2Mbps



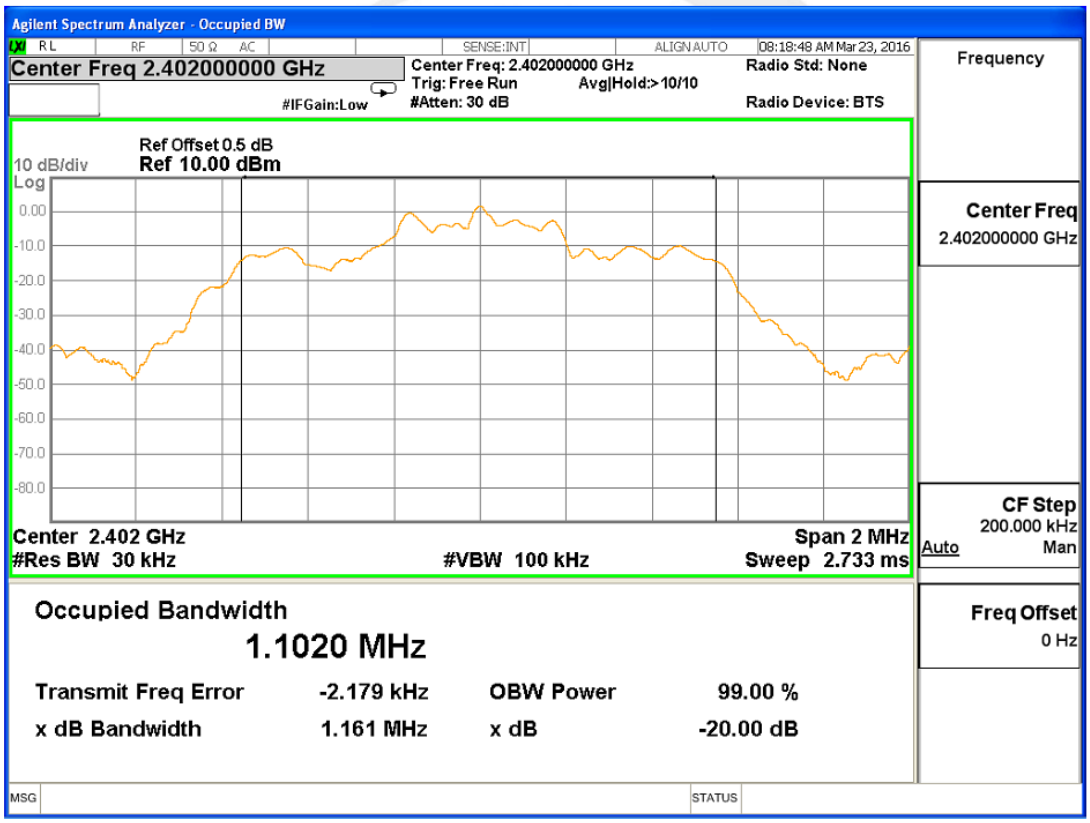
CH78 -2Mbps



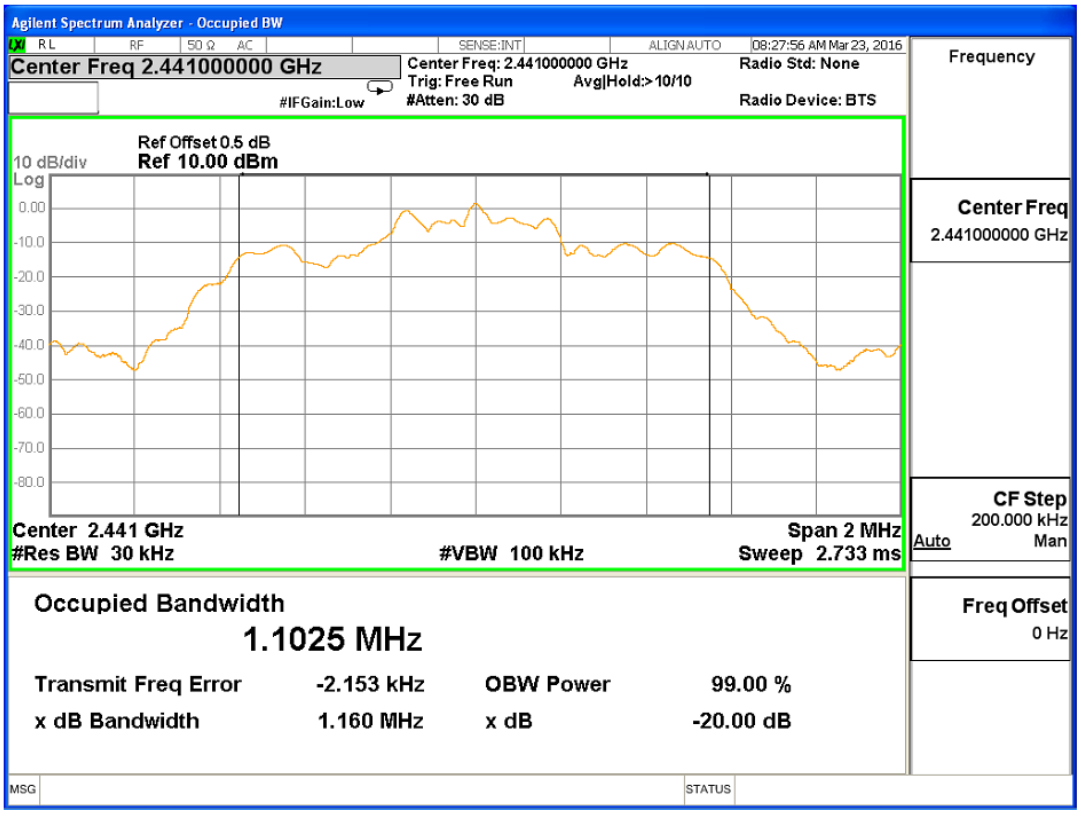
CH00 / CH39 /CH78 (8-DPSK(3Mbps)Mode)

Frequency (MHz)	20 dB BW (MHz)
2402	1.161
2441	1.160
2480	1.161

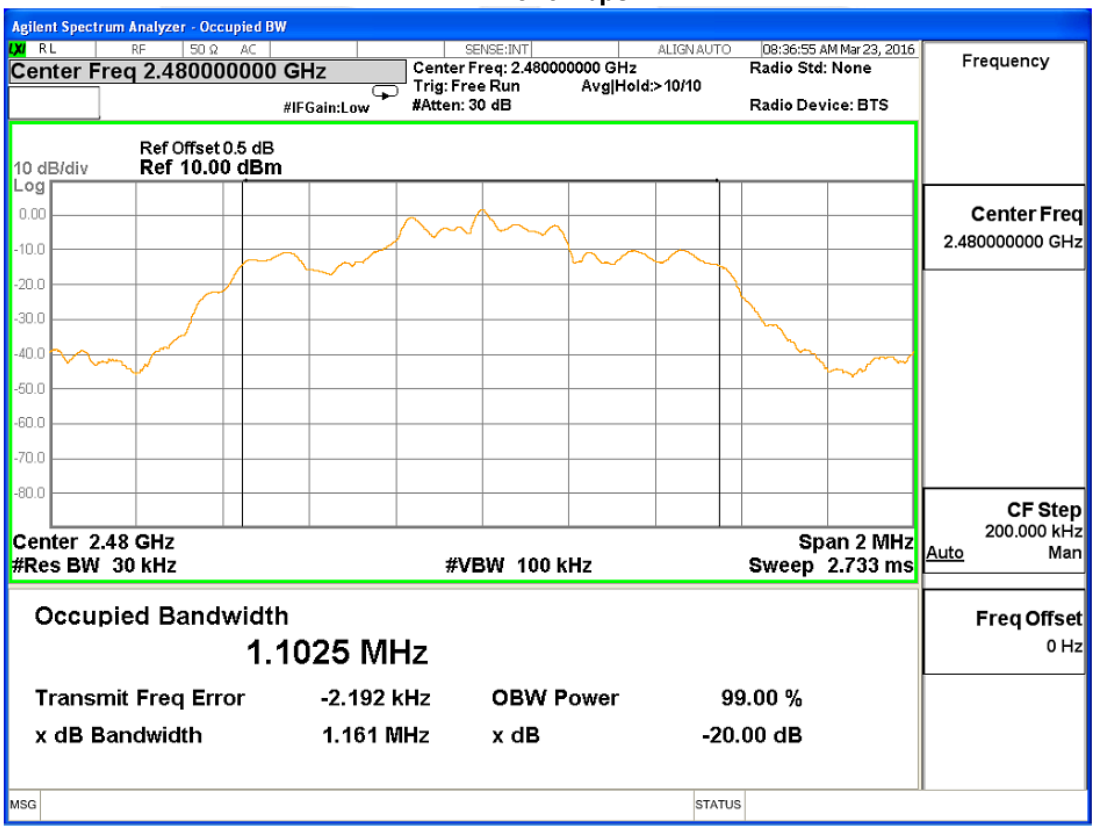
CH00 -3Mbps



CH39 -3Mbps



CH78 -3Mbps



3.10 Maximum Peak Output Power

Test Requirement: FCC Part 15 C section 15.247

(b)(1)For frequency hopping systems operating in the 2400-2483.5

MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band:

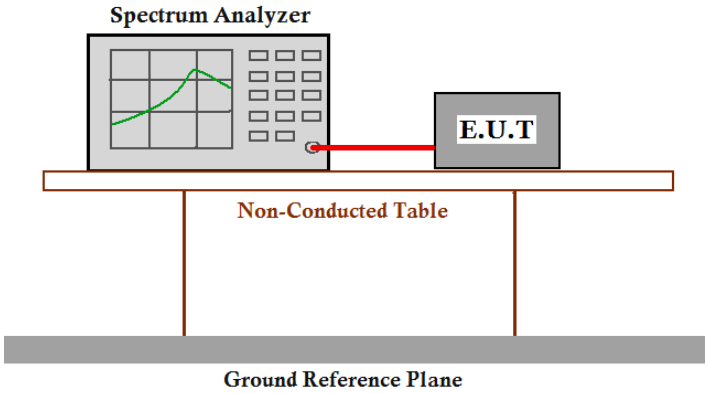
0.125 watts.

Test Method: ANSI C63.10: Clause 6.10 & DA 00-705

Test Limit:

Test mode: Pre-test the EUT in continuous transmitting mode at the lowest (2402 MHz), middle (2441 MHz) and highest (2480 MHz) channel with different data packet. Compliance test in continuous transmitting hopping GFSK(1Mbps), π/4-DQPSK(2Mbps), 8-DPSK(3Mbps) modes.

Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 2 MHz. VBW = 2 MHz. Sweep = auto; Detector Function =Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

Test Result:

GFSK(1Mbps)

Test channel	Frequency MHz	Reading level(dBm)	Conducted Output Power (dBm)	Limit dBm
CH 00	2402	2.224	5.024	30
CH 39	2441	2.320	5.120	30
CH 78	2480	2.263	5.063	30

Note: 1 watt=30dBm.

The channel separation > bandwidth.

Cable lose=2.8dB

π/4-DQPSK(2Mbps)

Test channel	Frequency MHz	Reading level(dBm)	Conducted Output Power (dBm)	Limit dBm
CH 00	2402	0.787	3.587	20.96
CH 39	2441	0.832	3.632	20.96
CH 78	2480	0.621	3.421	20.96

Note: 0.125 watt=20.96dBm.

The channel separation > 2/3 bandwidth.

Cable lose=2.8dB

8-DPSK (3Mbps

Test channel	Frequency MHz	Reading level(dBm)	Conducted Output Power (dBm)	Limit dBm
CH 00	2402	0.569	3.369	20.96
CH 39	2441	0.554	3.354	20.96
CH 78	2480	0.302	3.102	20.96

Note: 0.125 watt=20.96dBm.

The channel separation > 2/3 bandwidth.

Cable lose=2.8dB

3.11 Antenna equirement

Standard requirement

15.203 requirement:

For intentional device. According to 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.

15.247(c) (1)(i) requirement:

(i) Systems operating in the 2400-2483.5 MHz bands that are used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna

One simple retractable rod antenna without any connectors.
The external antenna is integrated on the main PCB and no consideration of replacement.
The best case gain of the antenna is 1dBi.

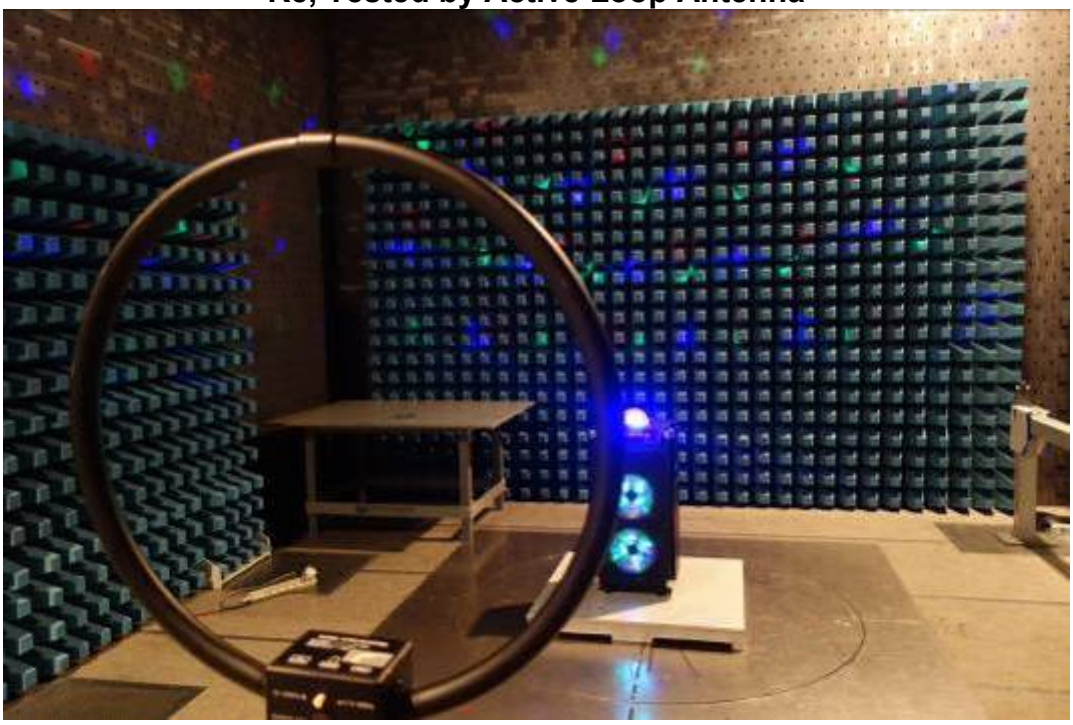
Test result: The unit does meet the FCC requirements.

4 APPENDIX

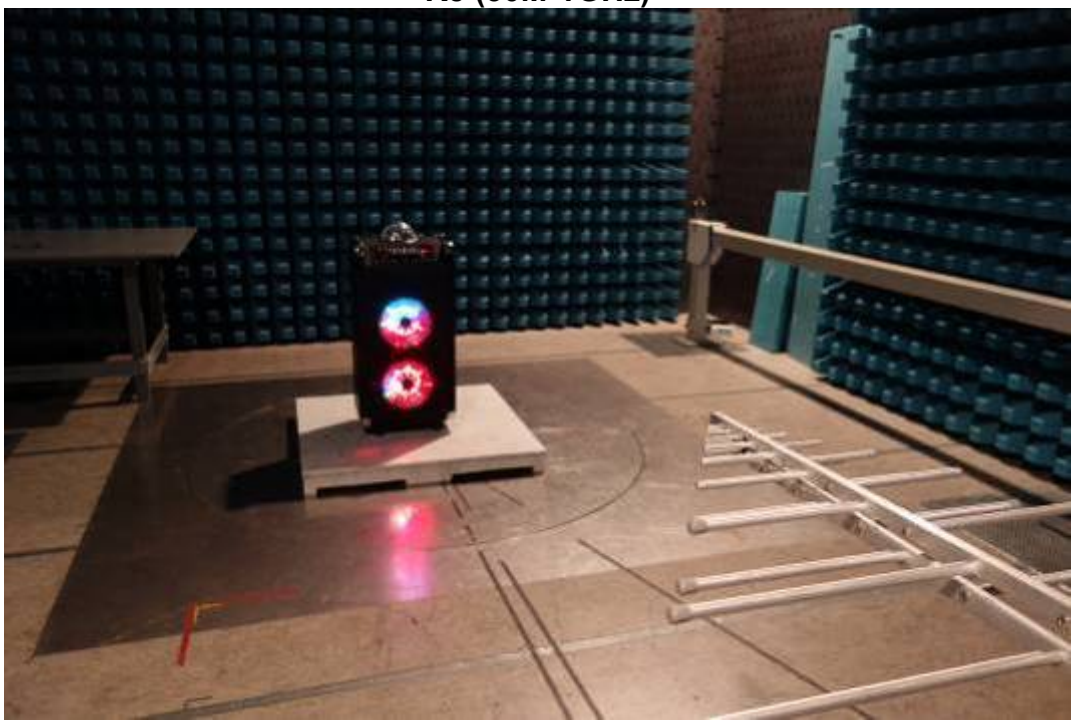
4.1 Photographs of the Test Arrangement

Conducted Emissions

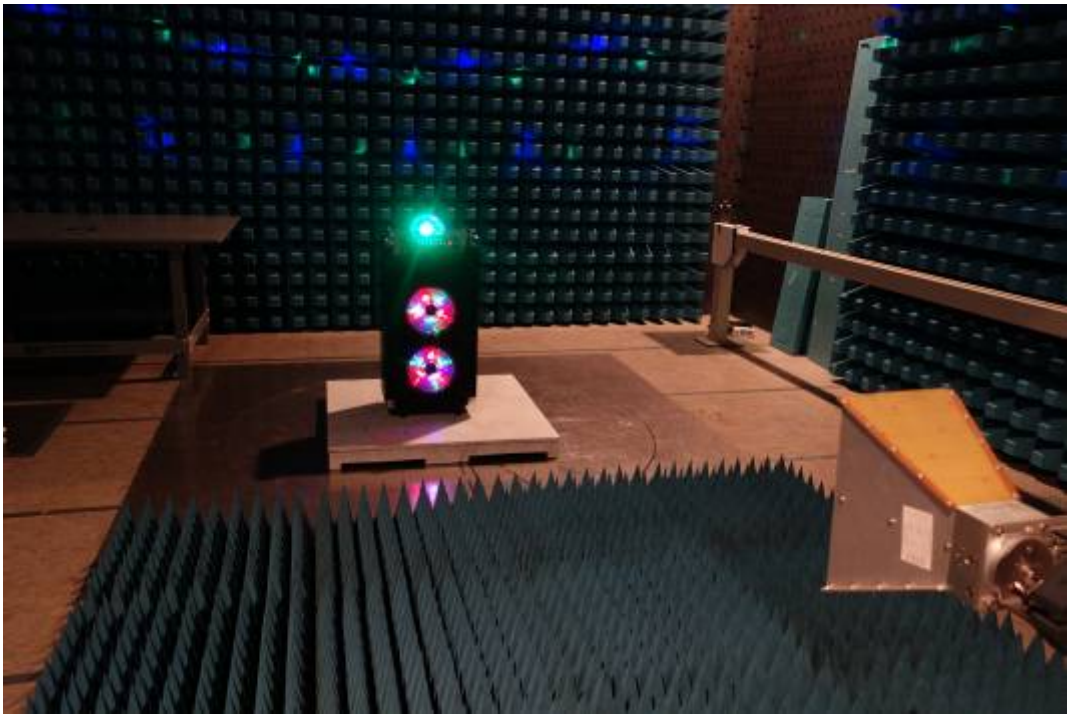
Re, Tested by Active Loop Antenna



Re (30M-1GHz)

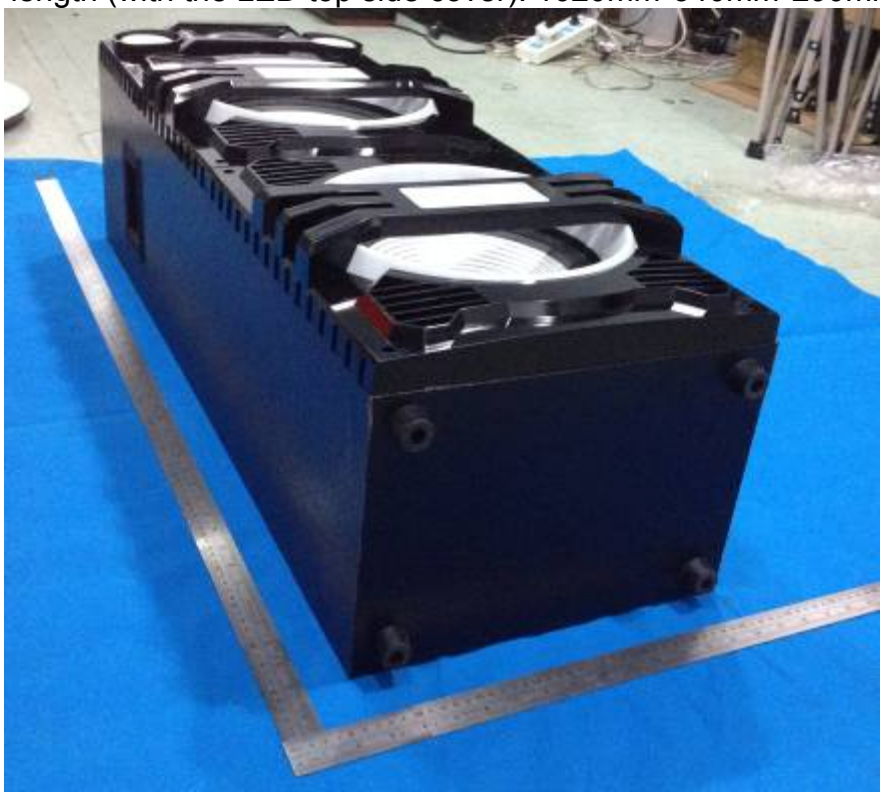


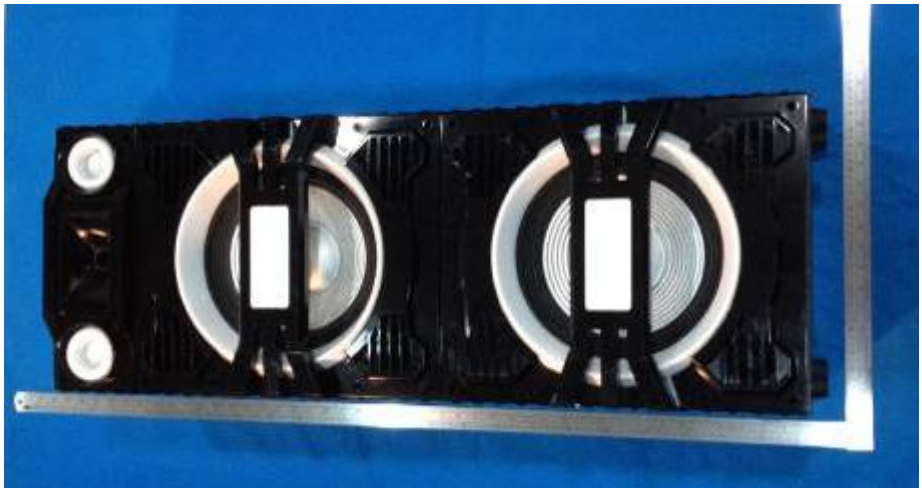
Re (Above1GHz)

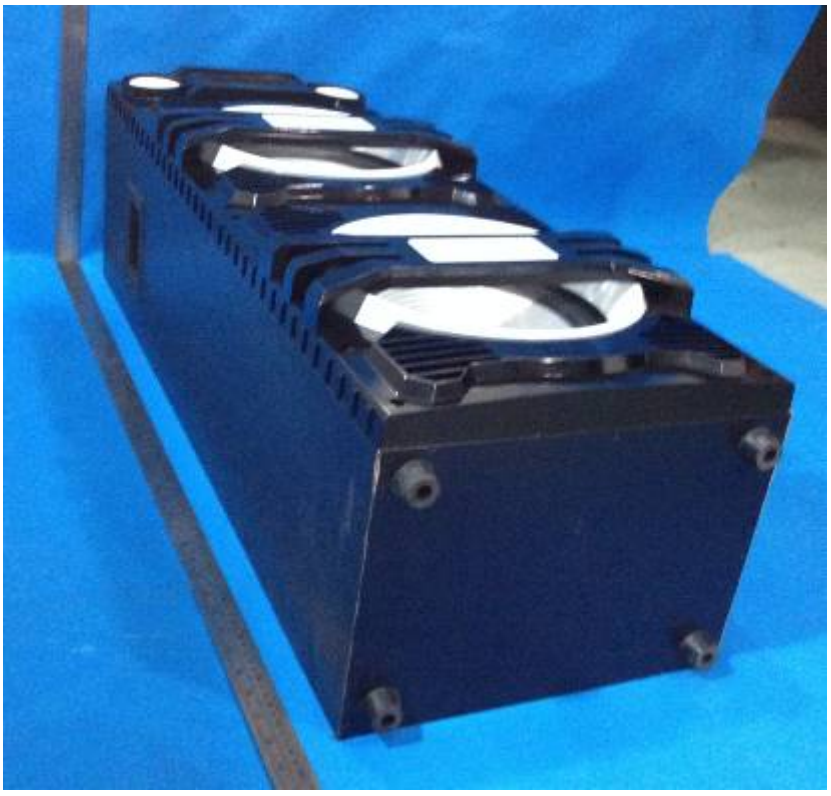


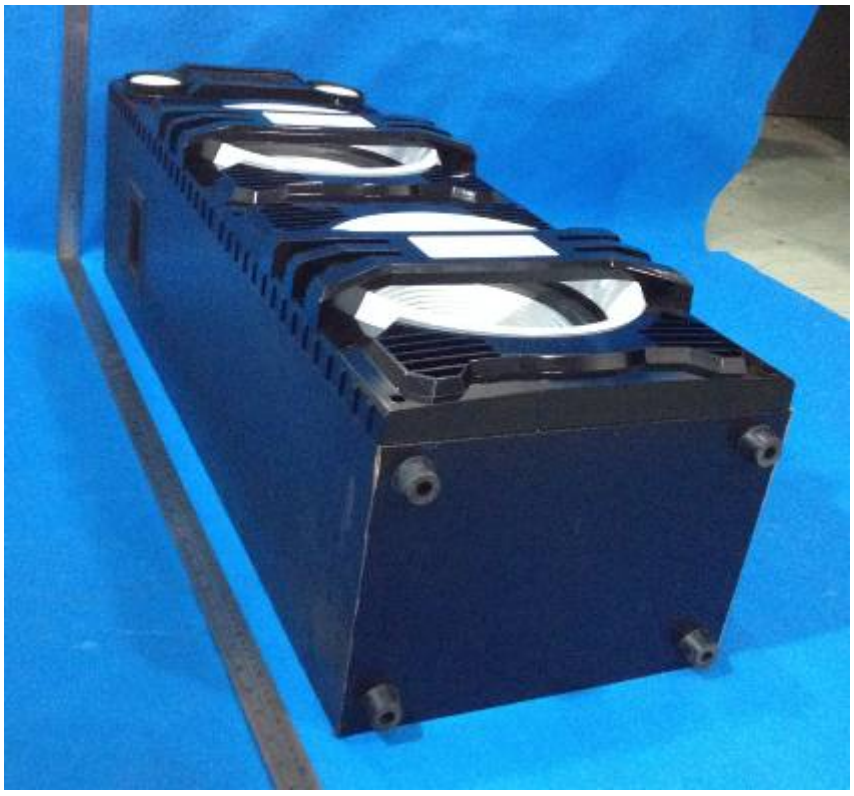
4.2 Photographs of EUT Constructional Details

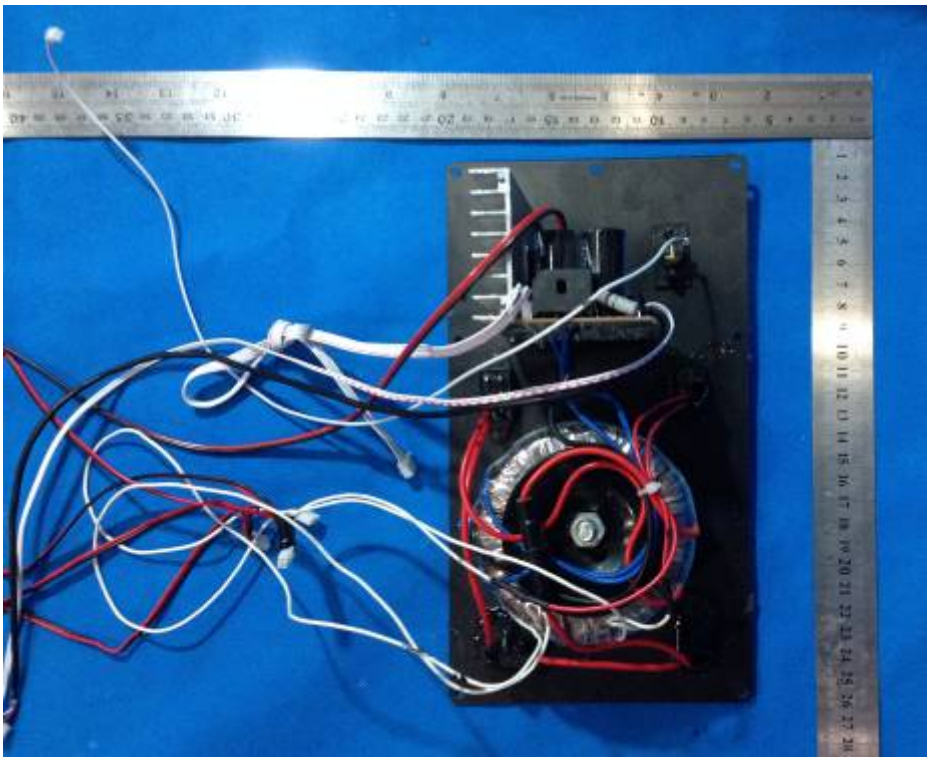
ACE210, length (without the LED top side cover): 943mm*340mm*290mm
length (with the LED top side cover): 1020mm*340mm*290mm

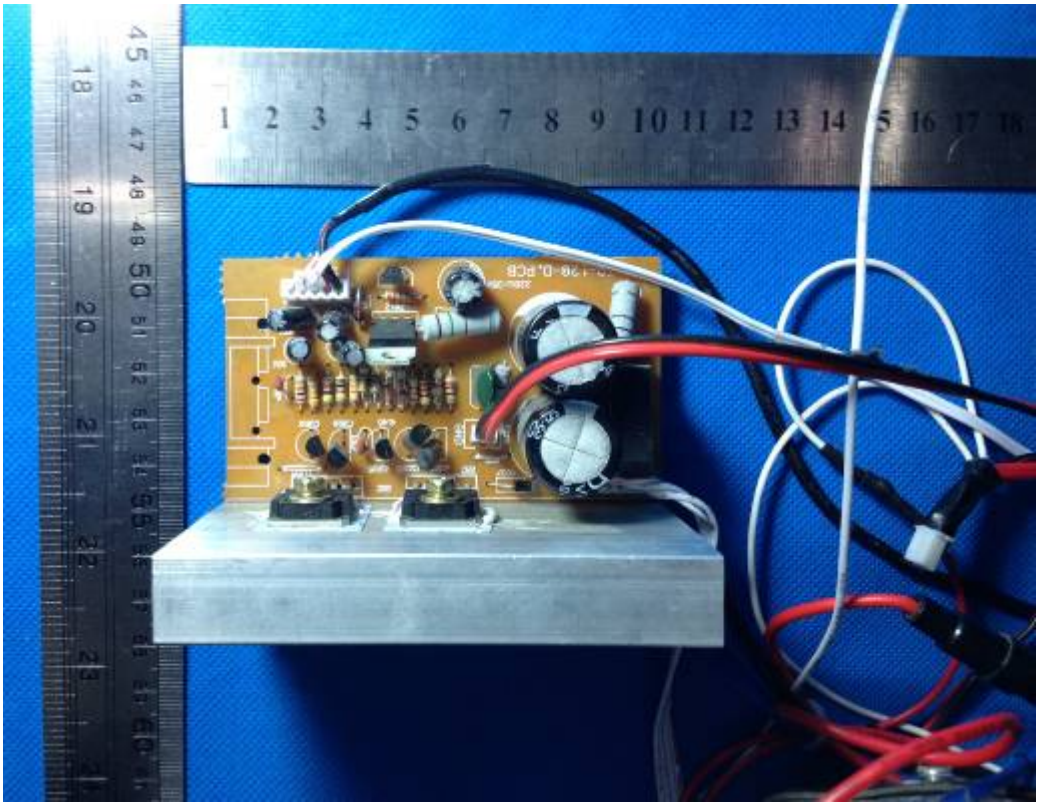


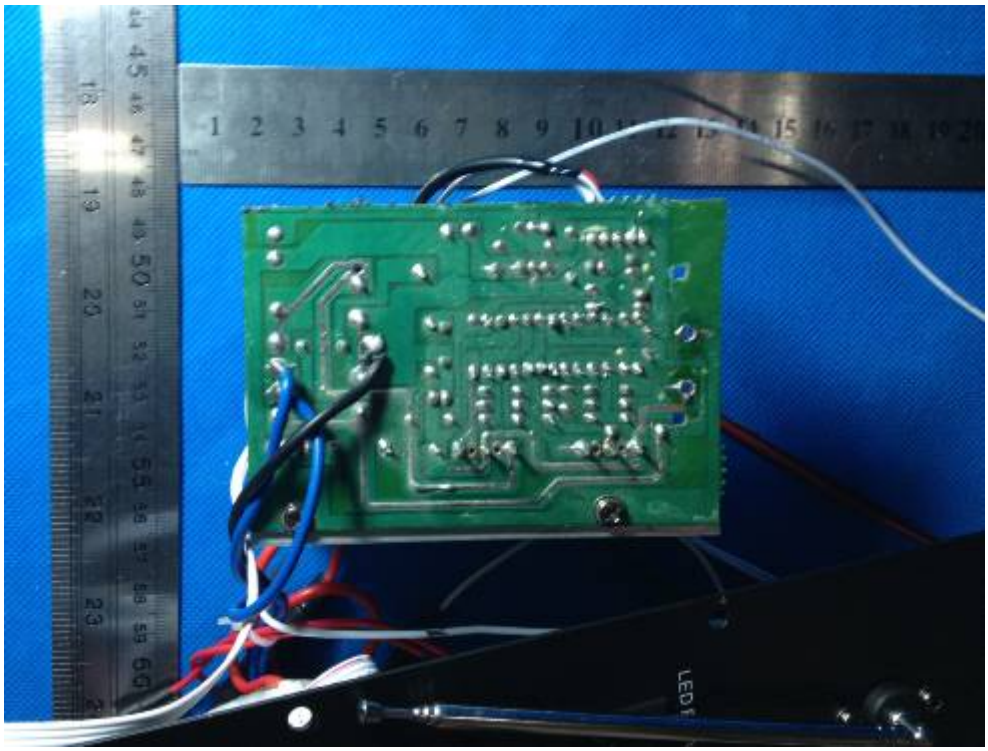


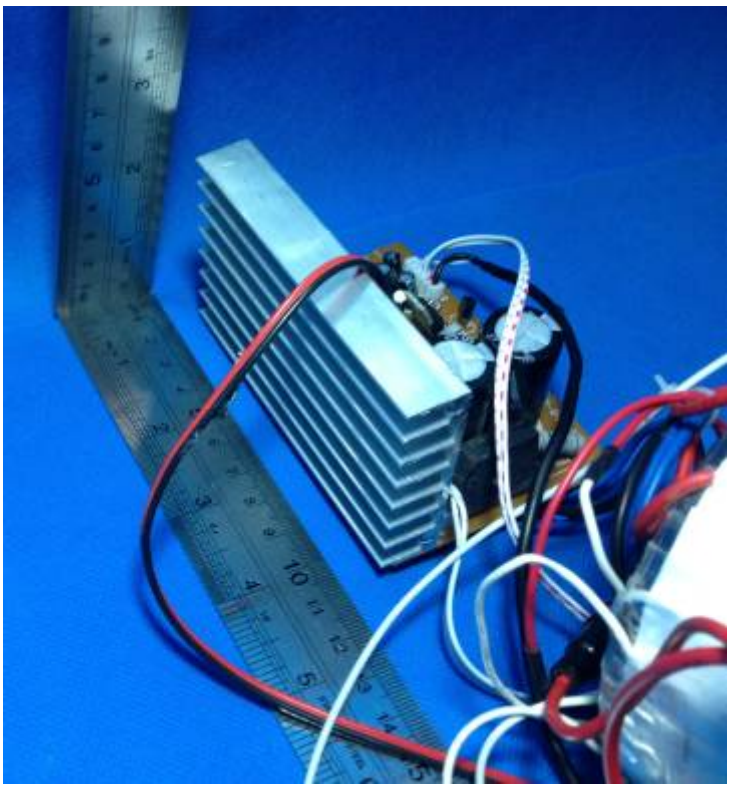


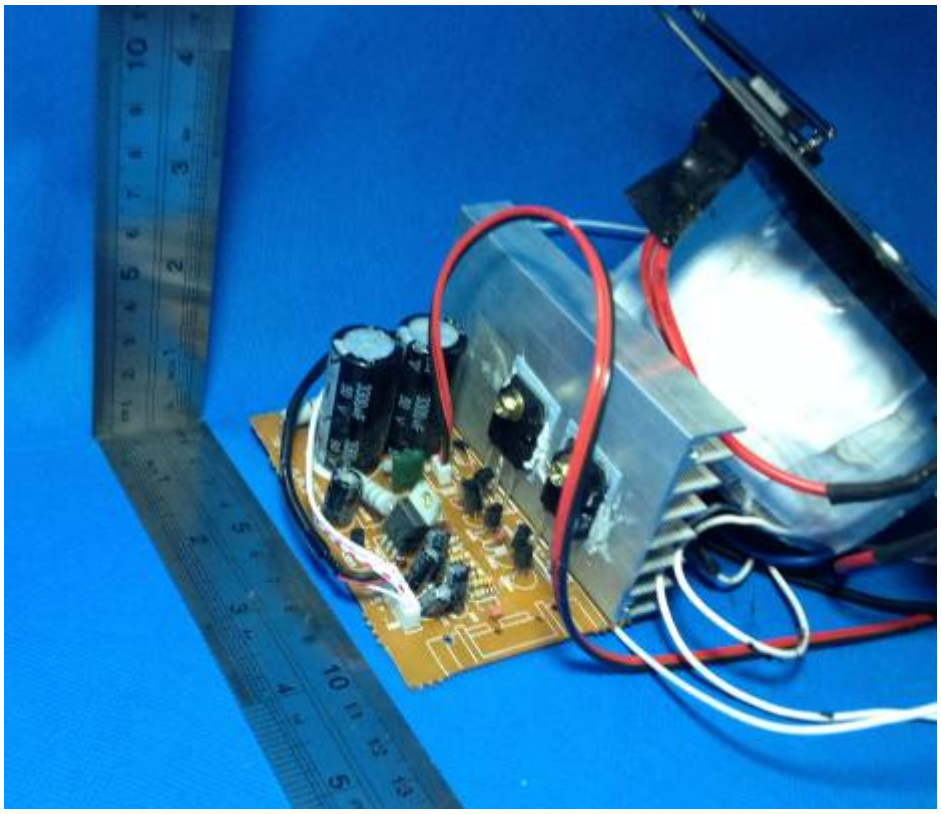


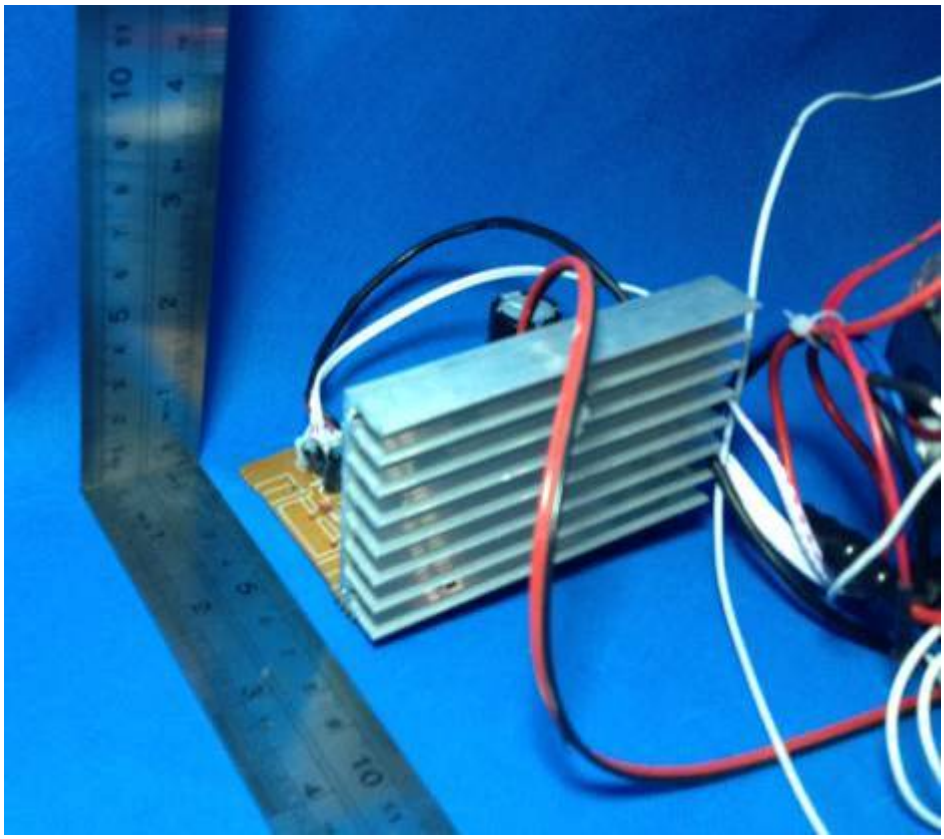


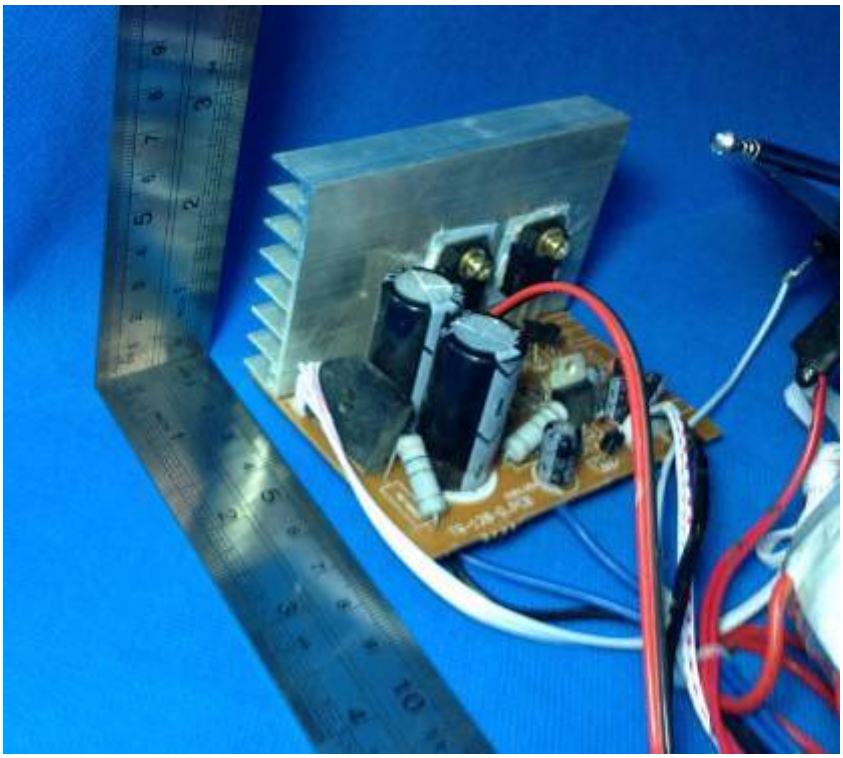


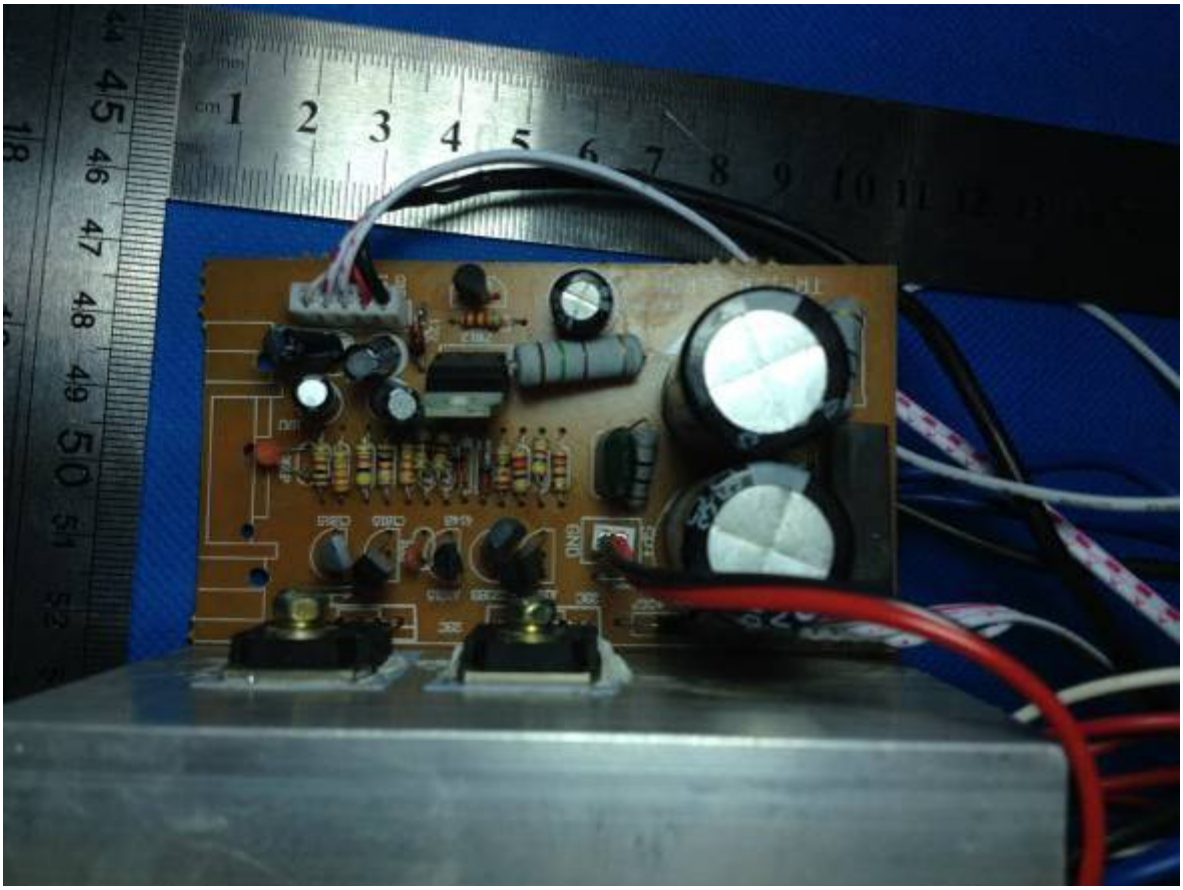


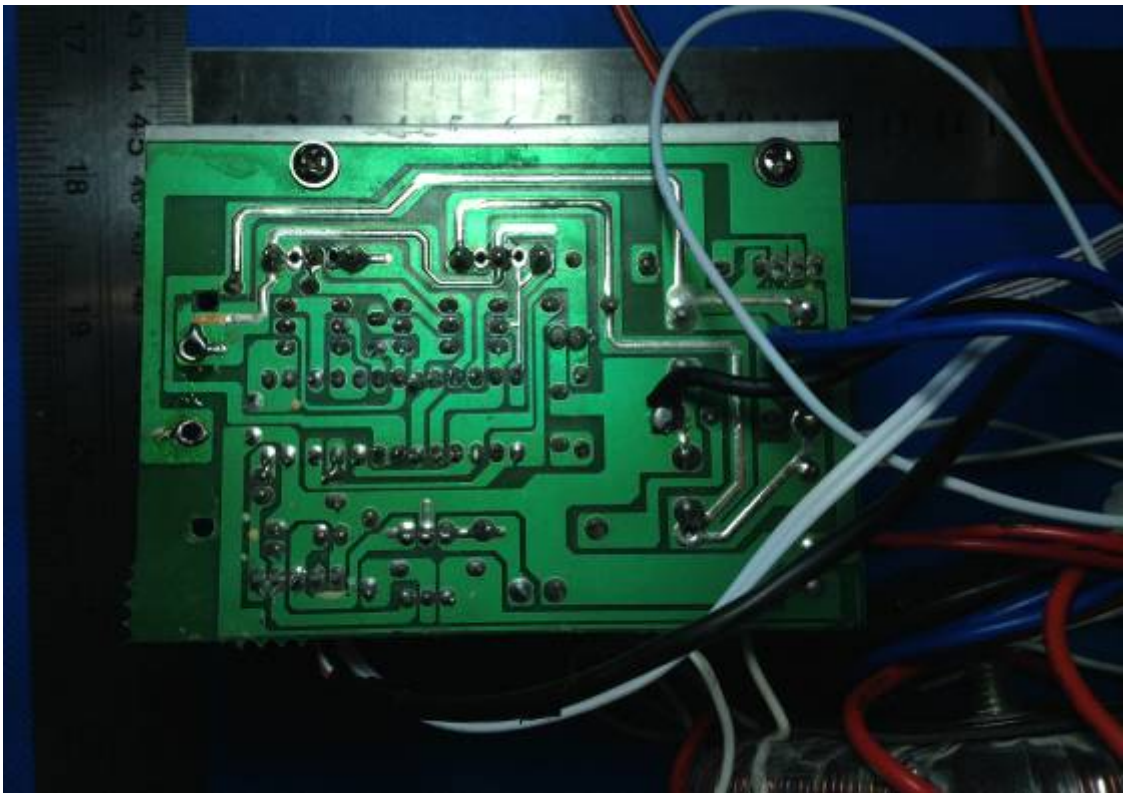


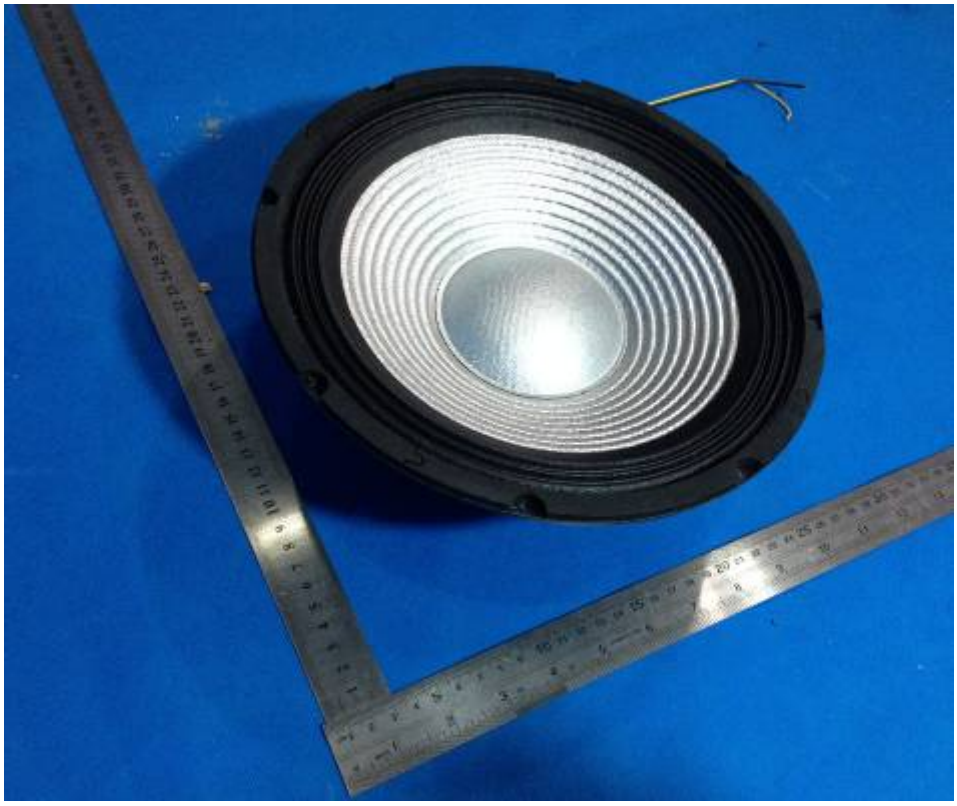


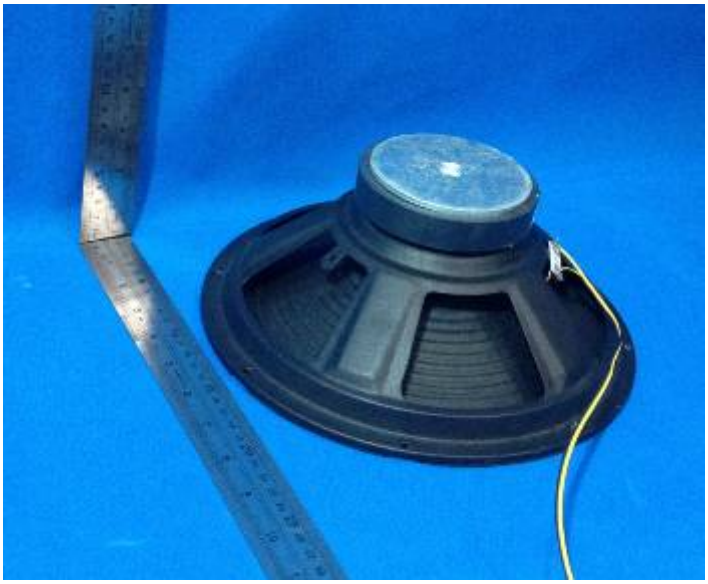


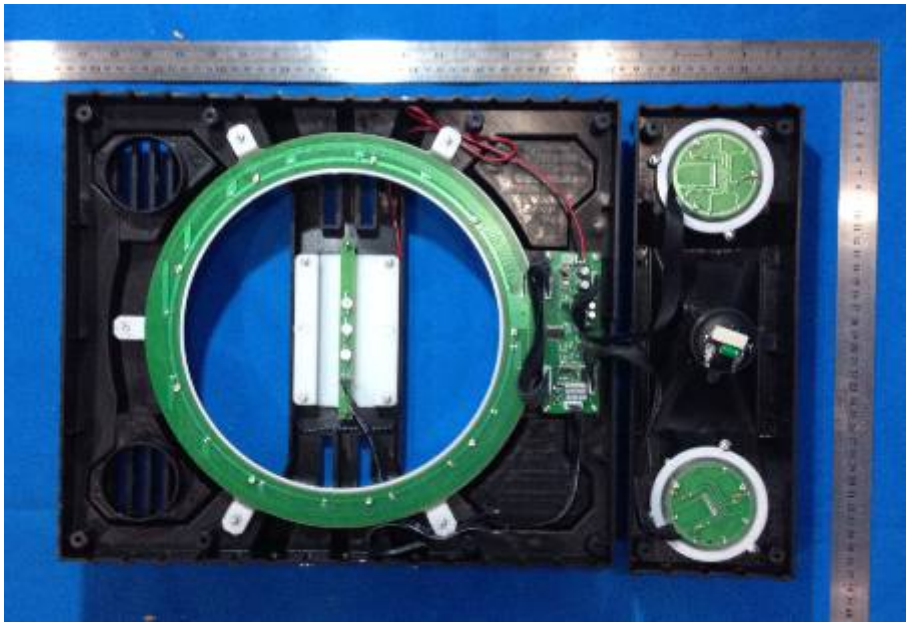


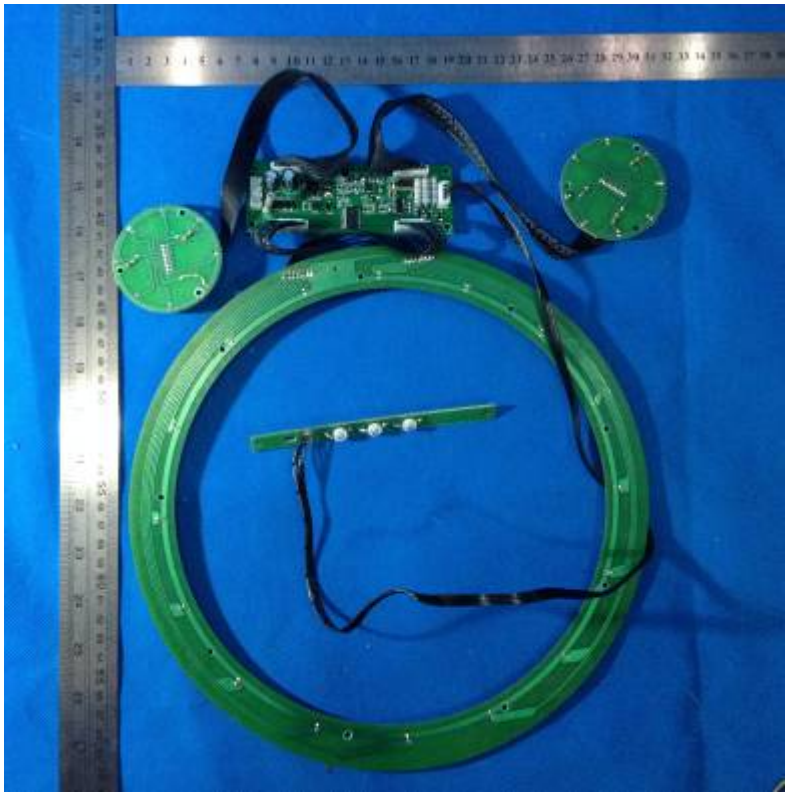


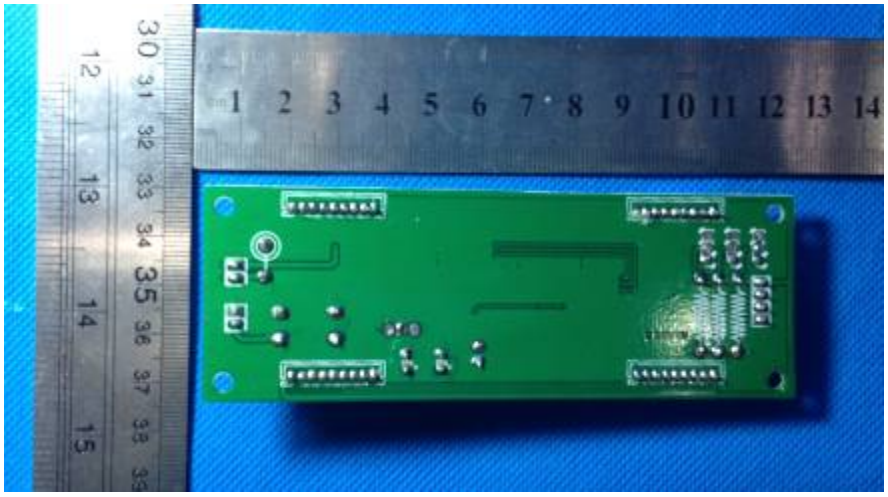


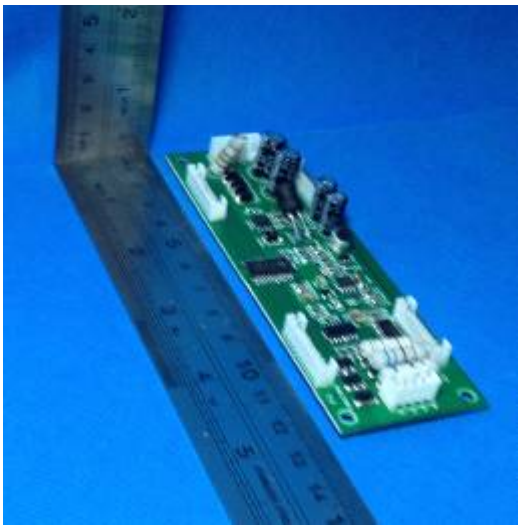


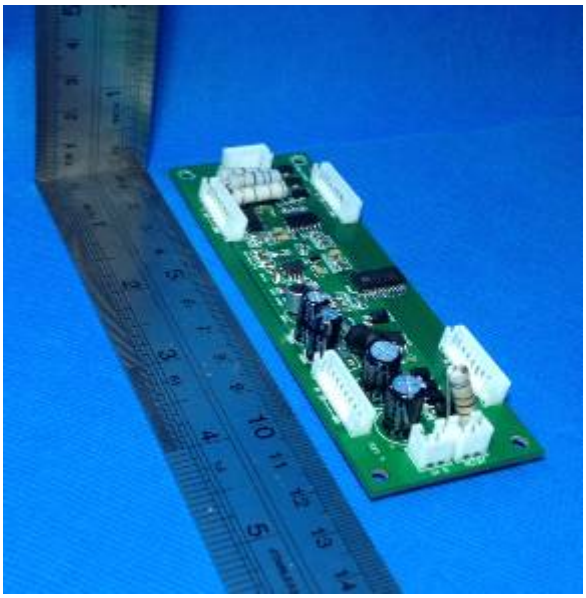


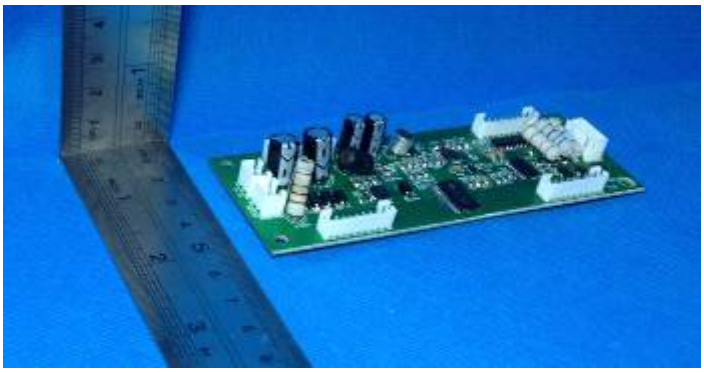


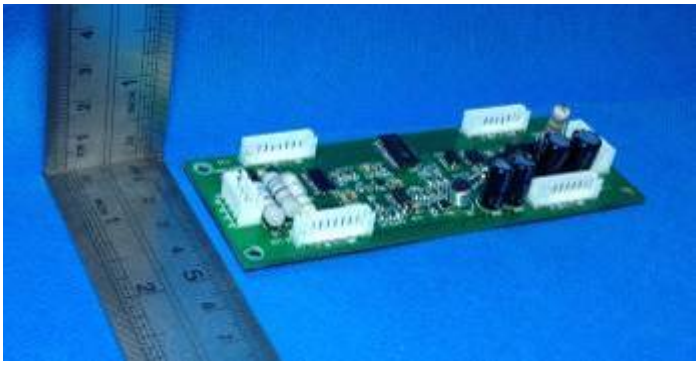


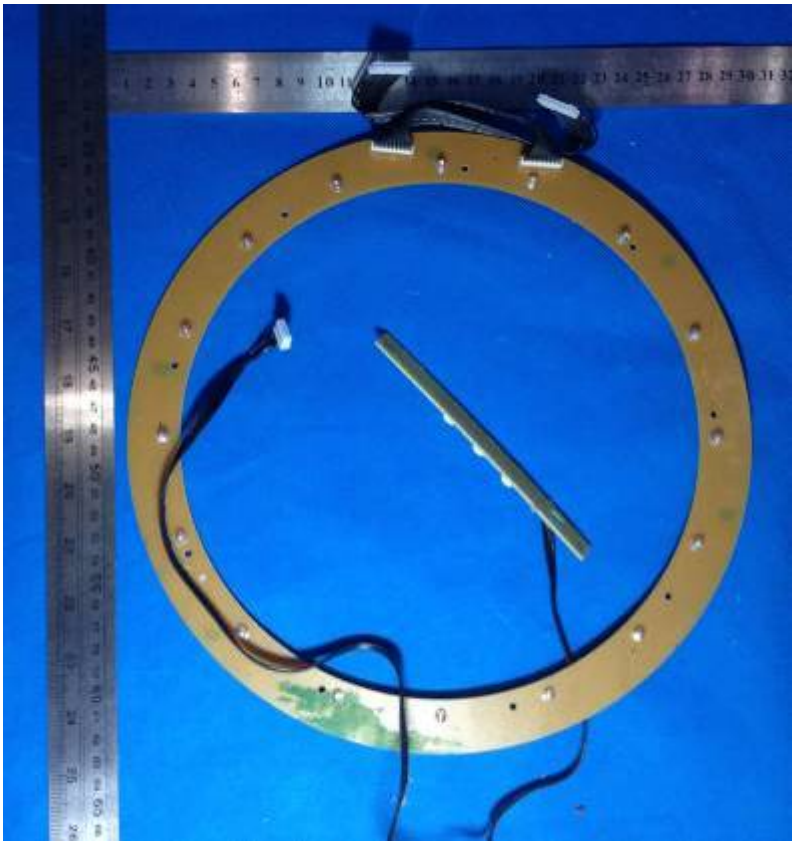


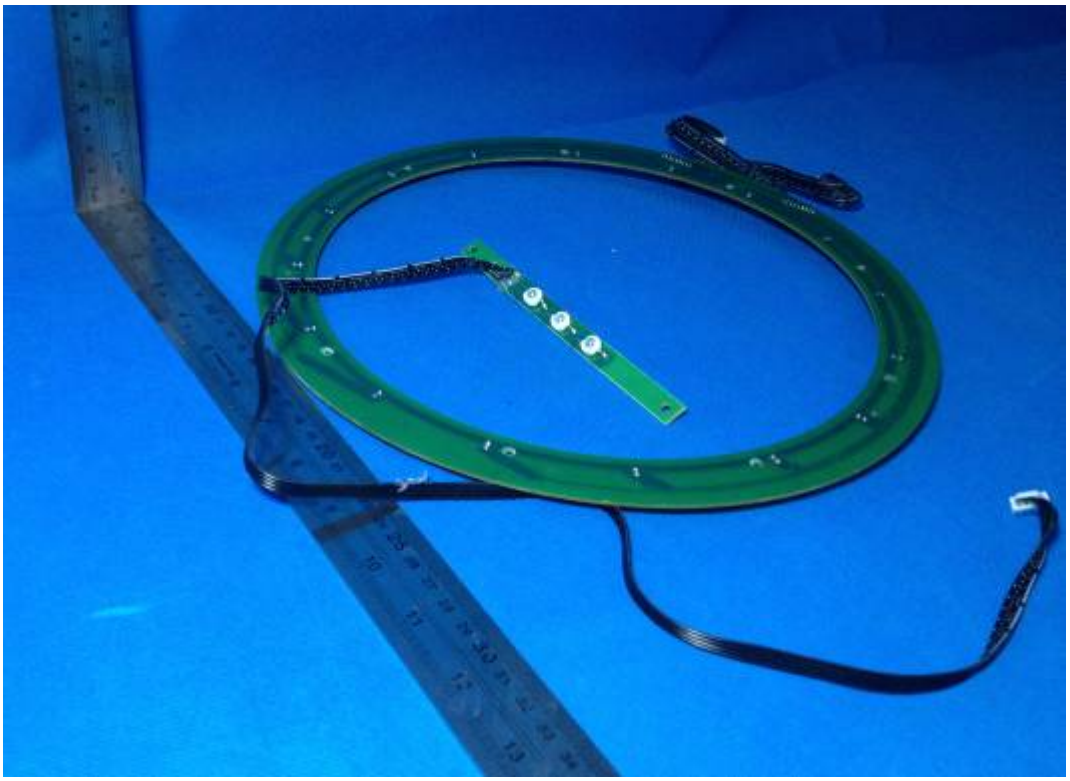


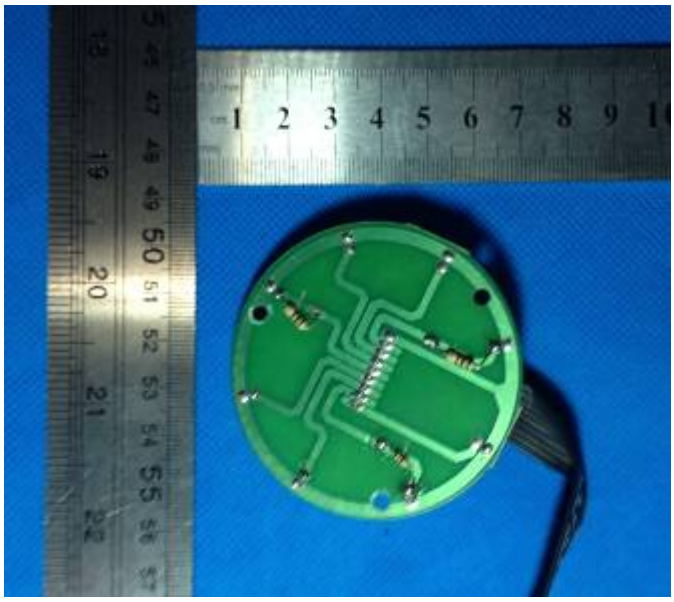


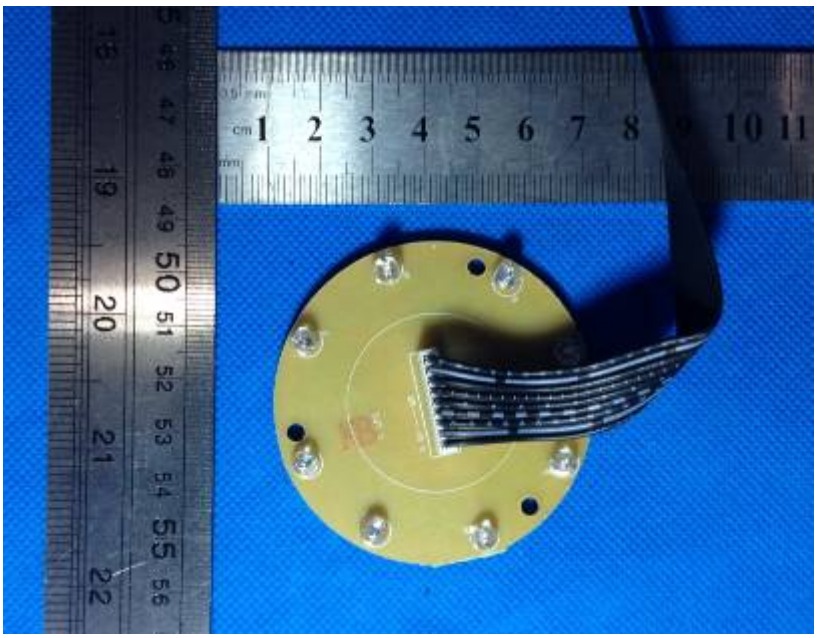


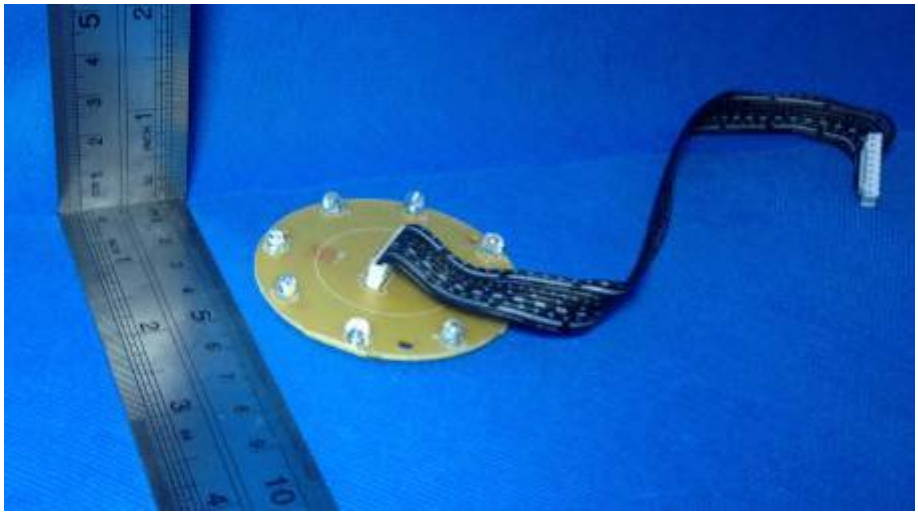


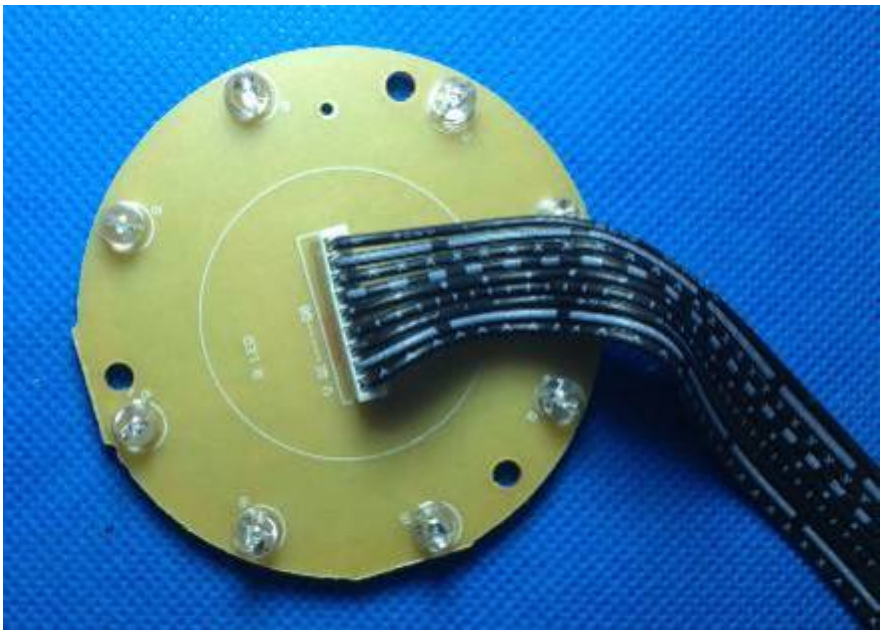


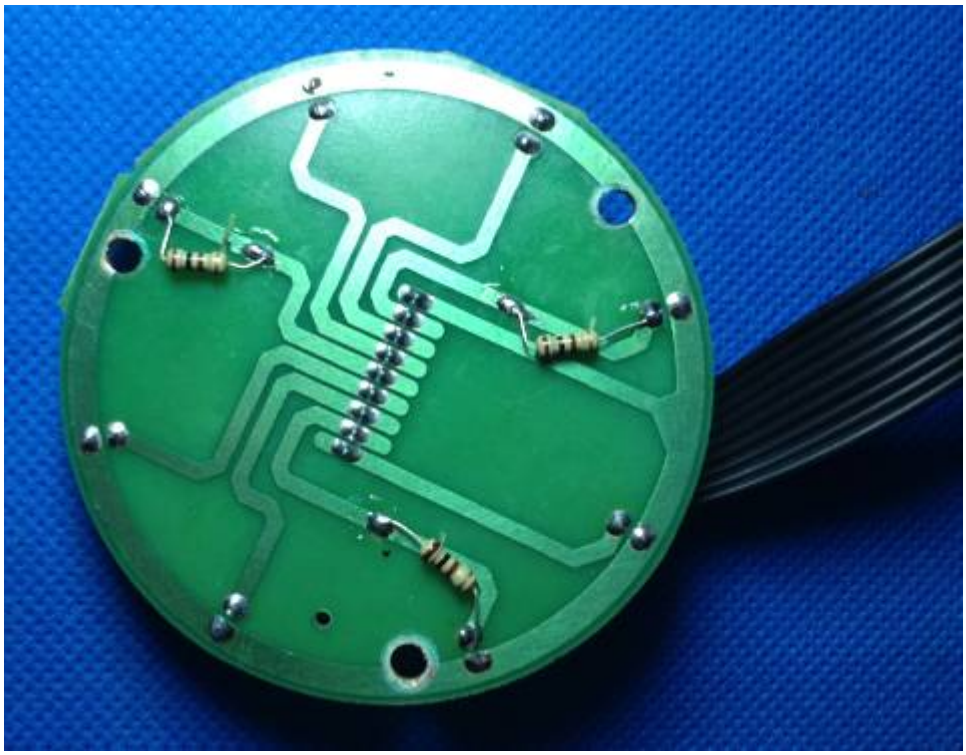


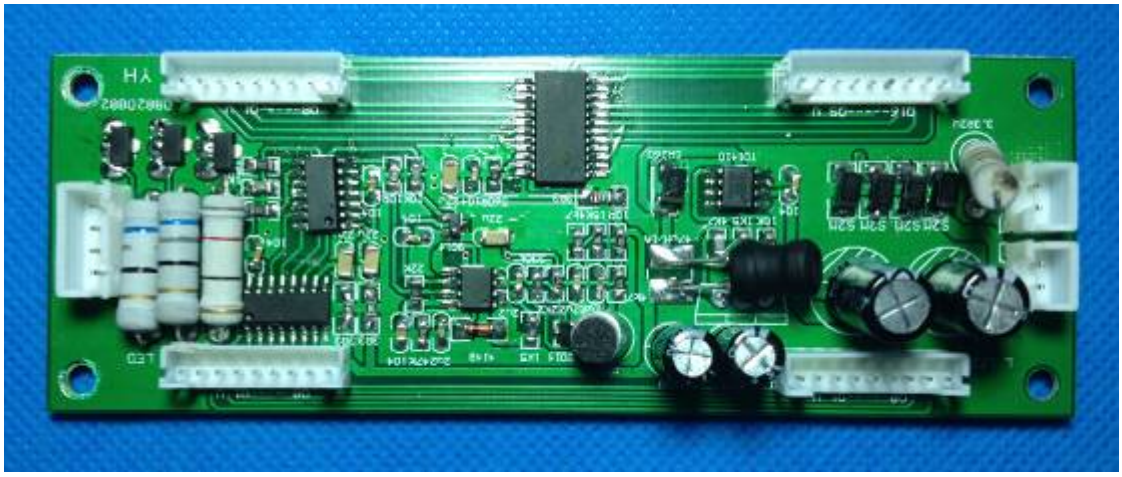


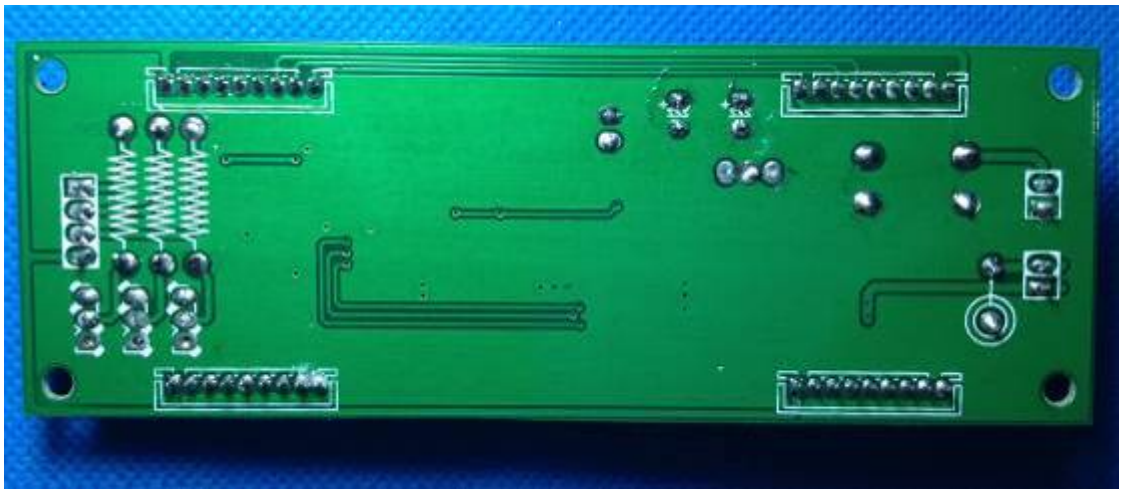


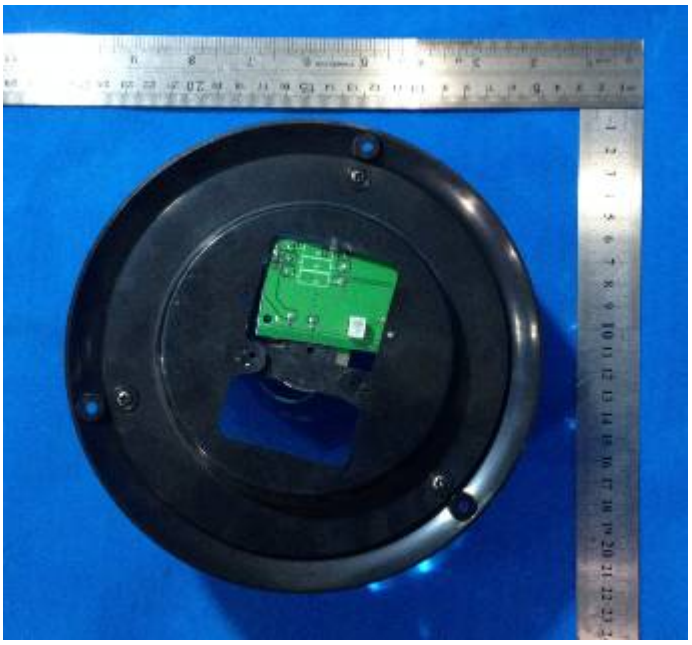


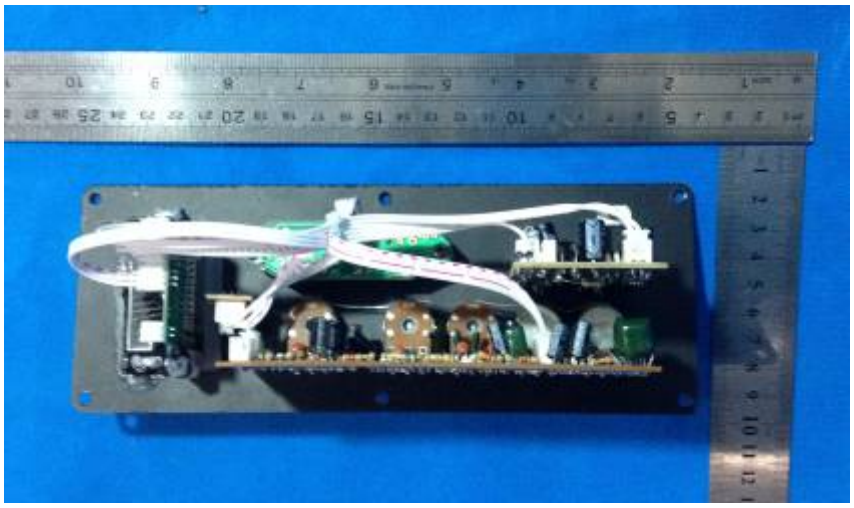


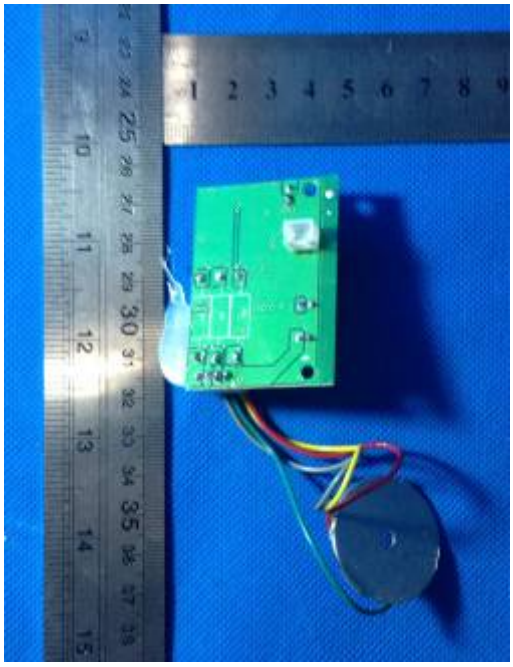


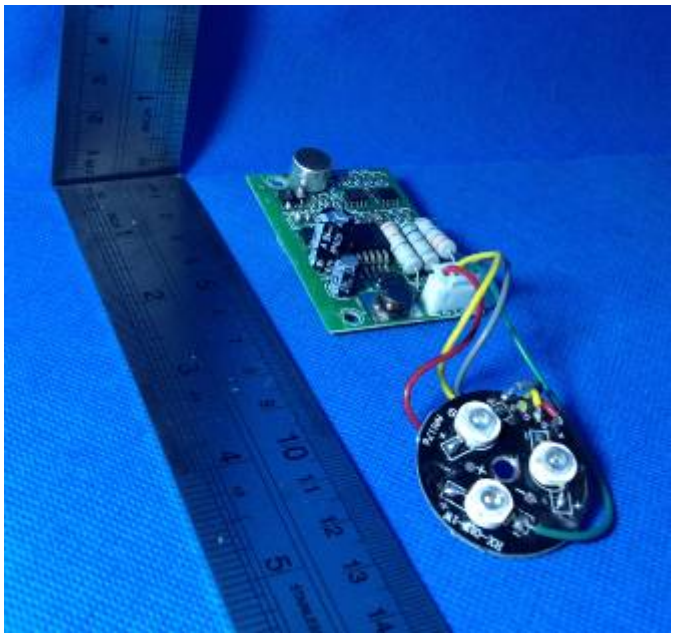


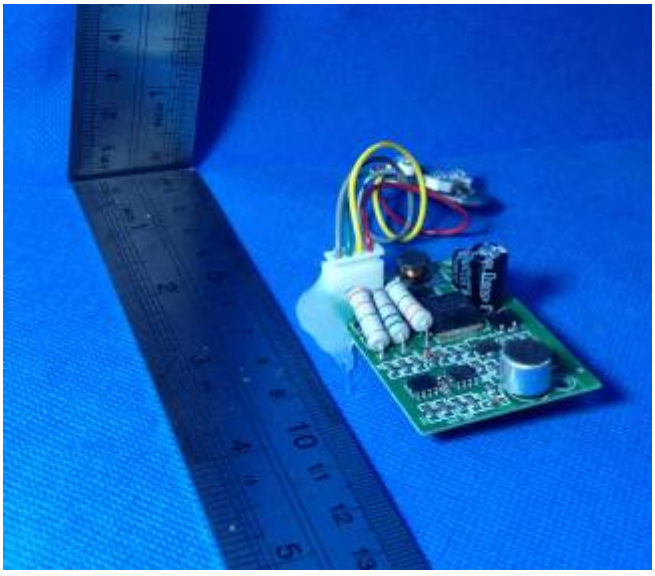


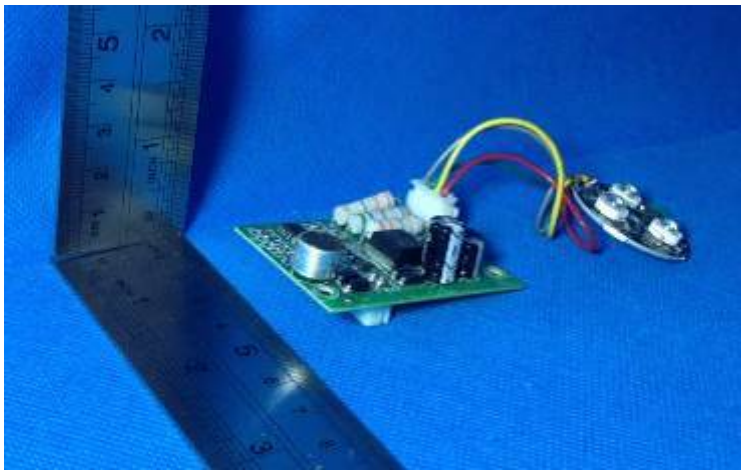


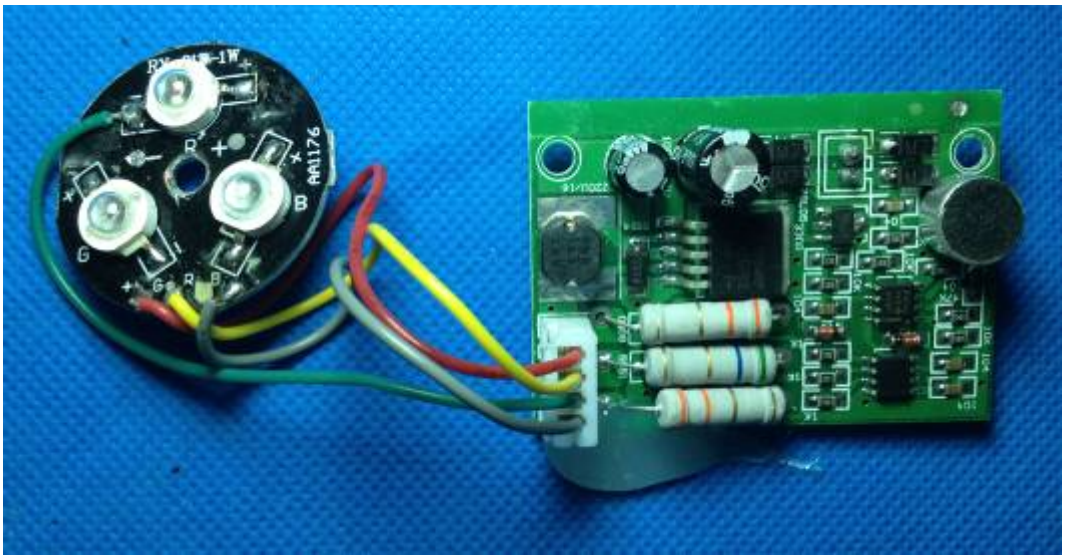


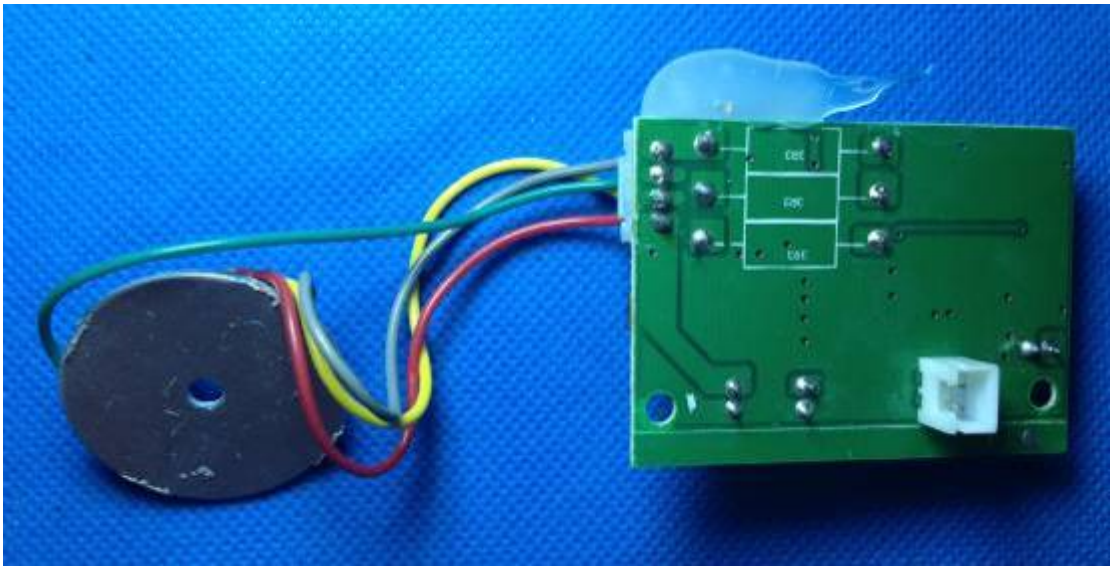


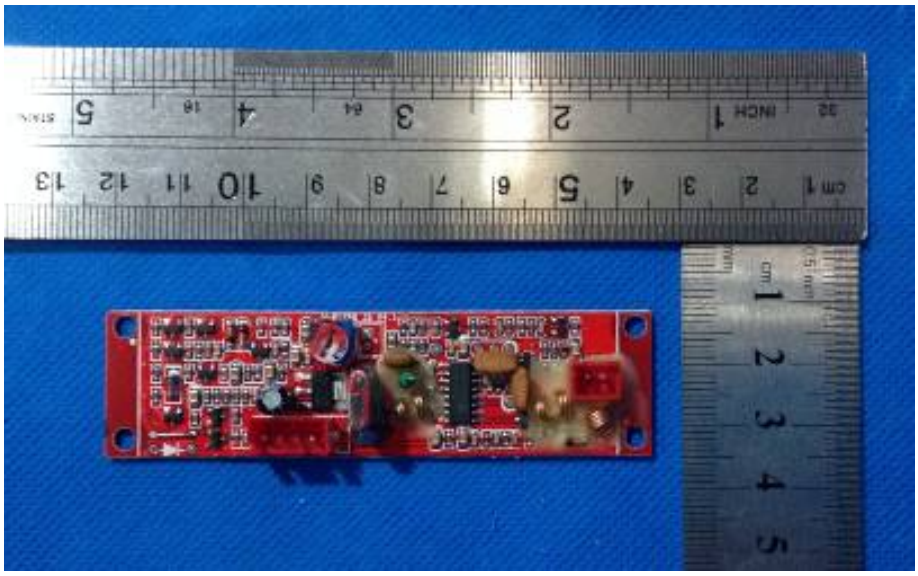


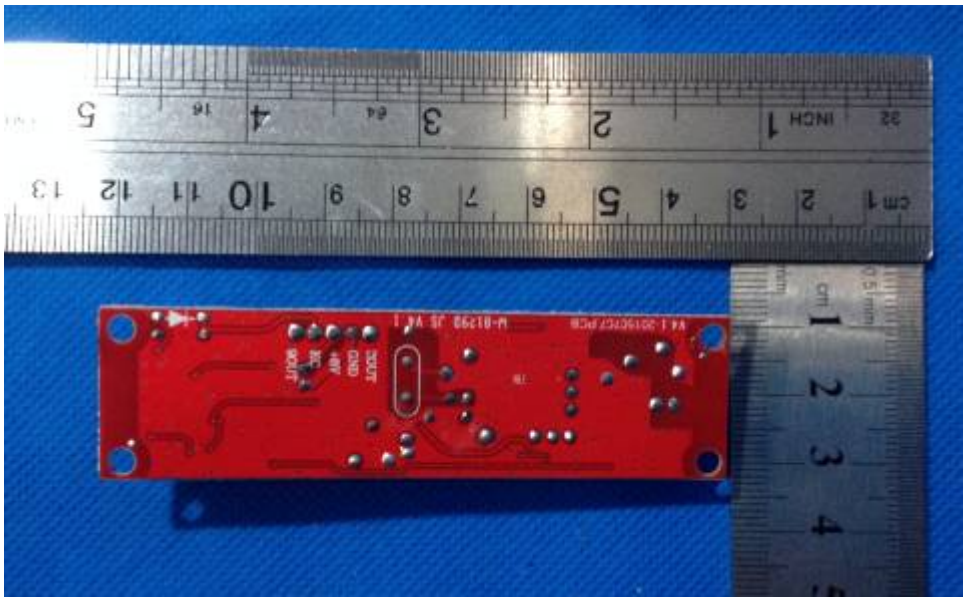


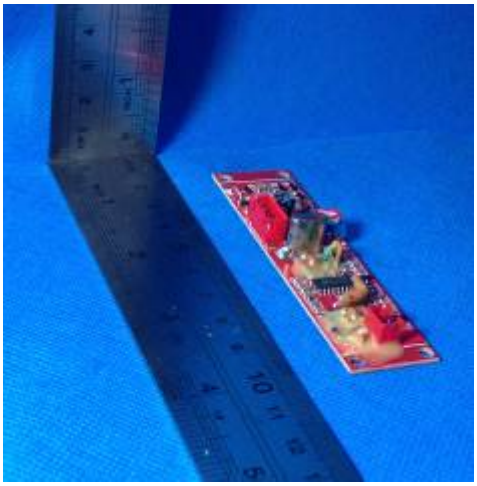


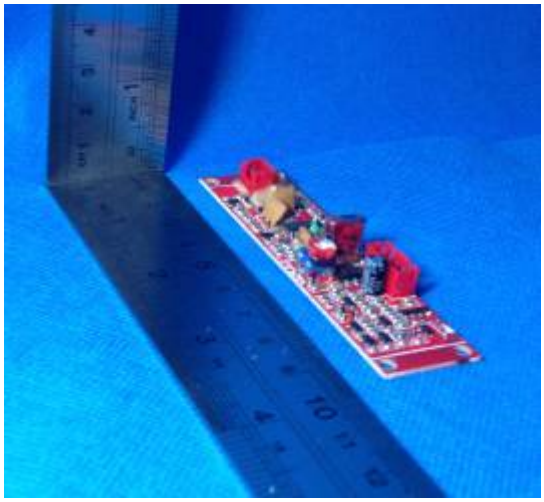


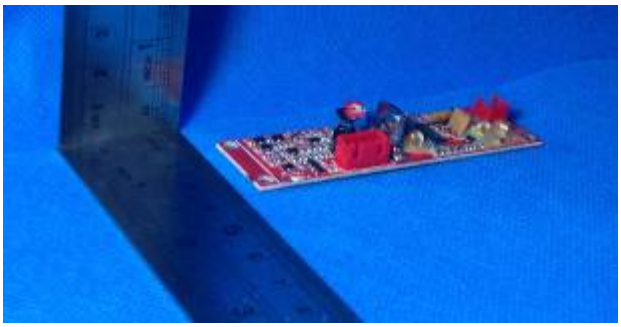


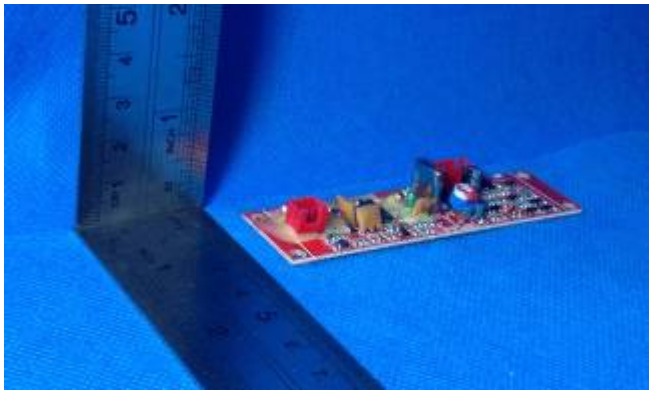


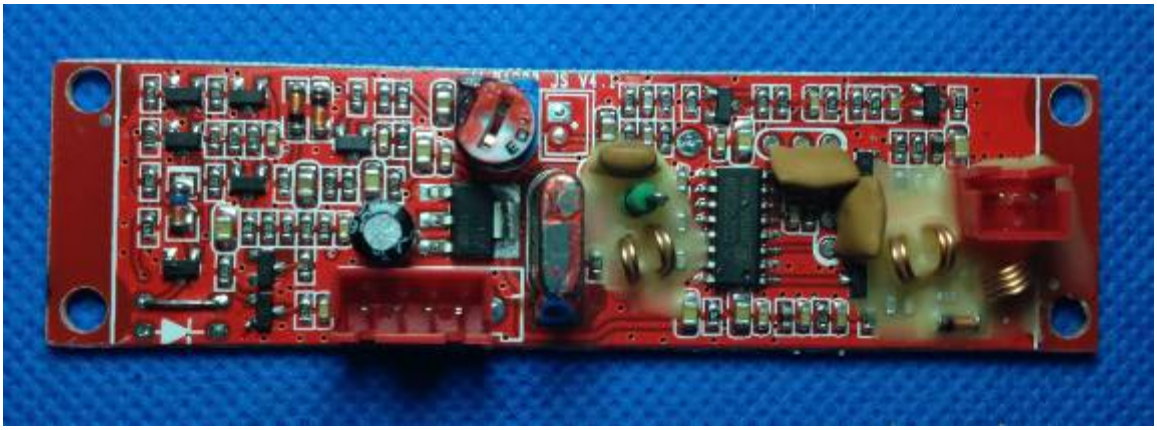


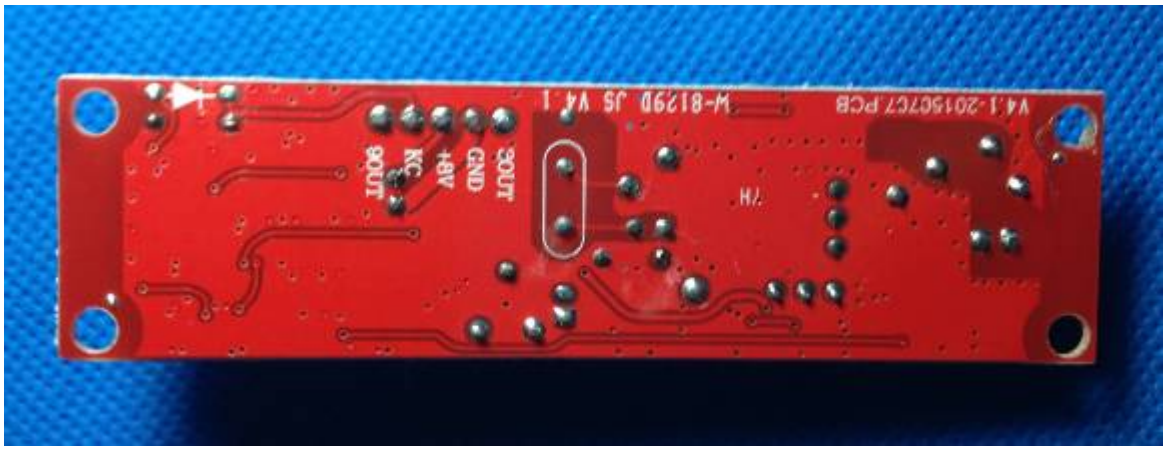


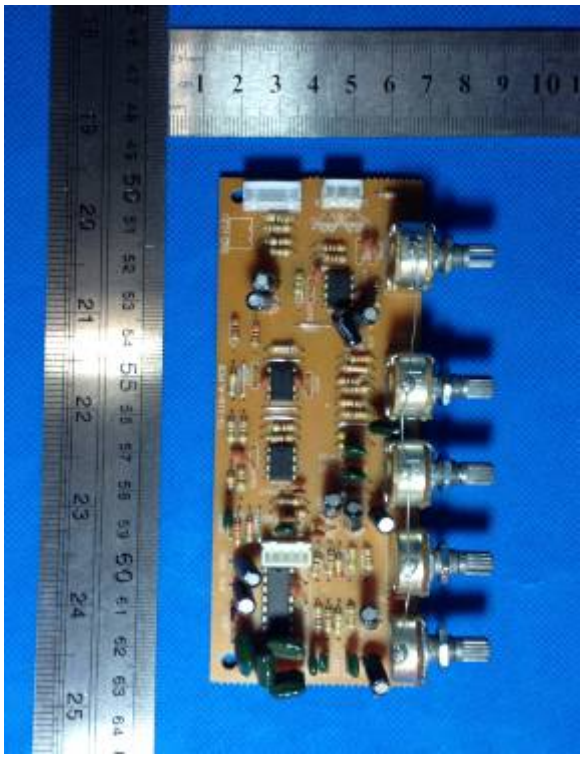


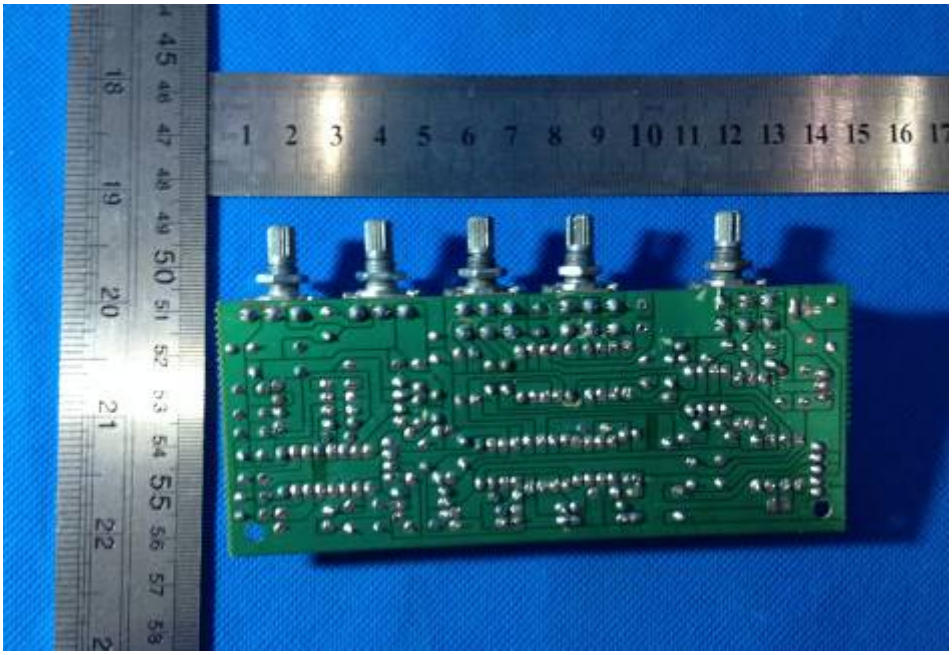


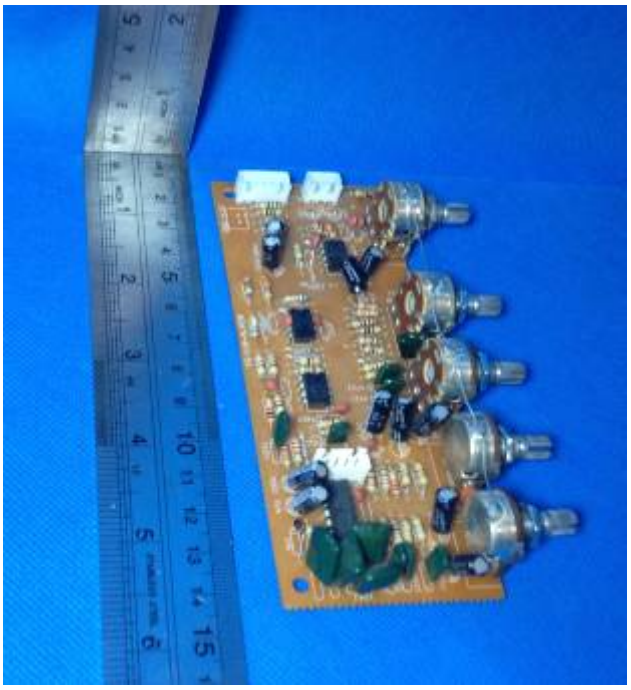


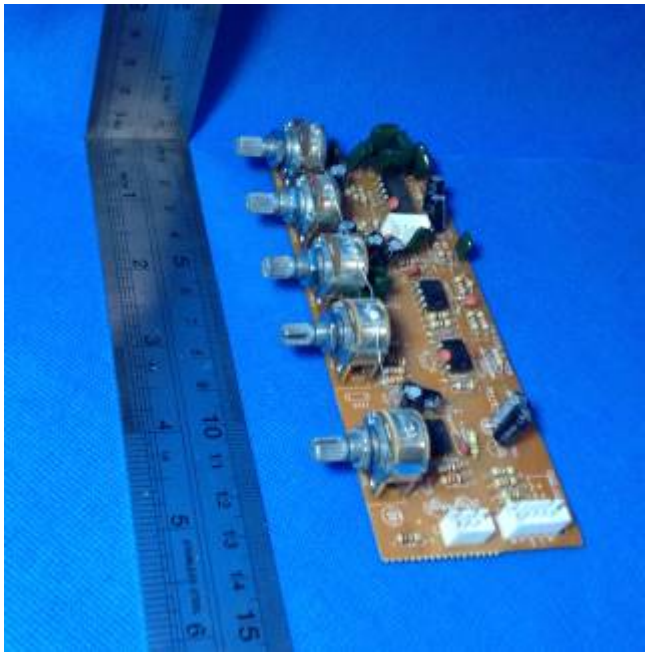


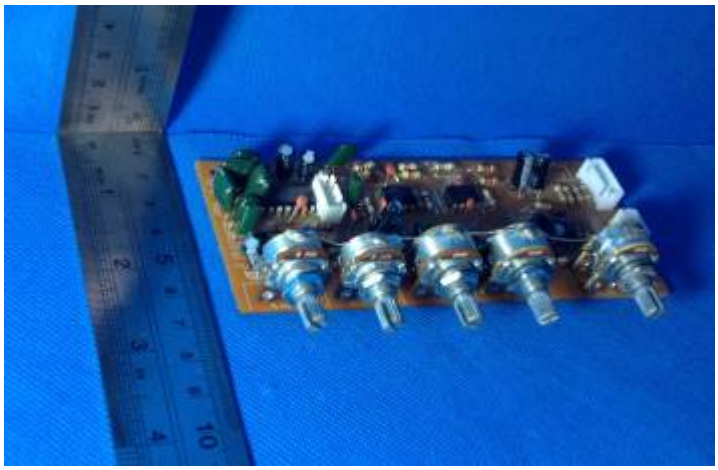

W-8129D JS V4.1
V4.1-20150727 PCB
SOUT
GND
+8V
NC
SOUT

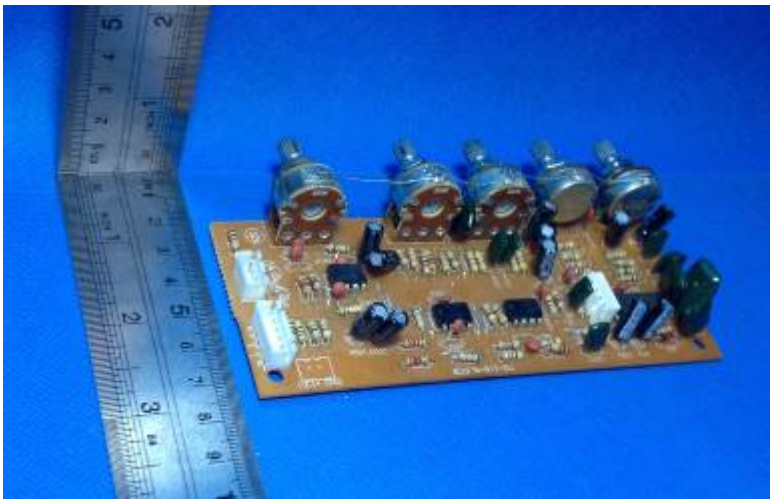


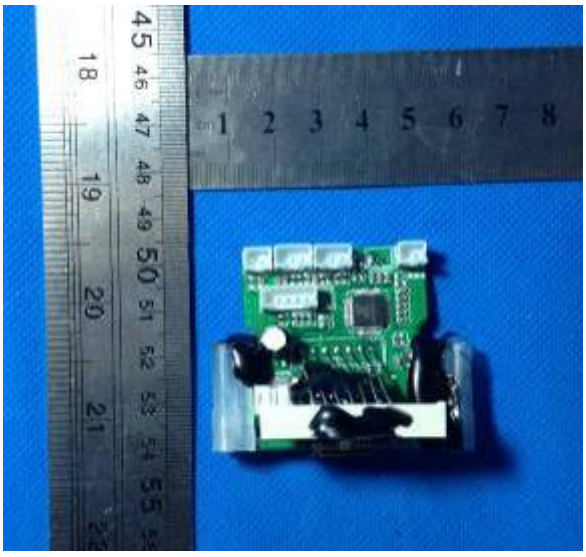


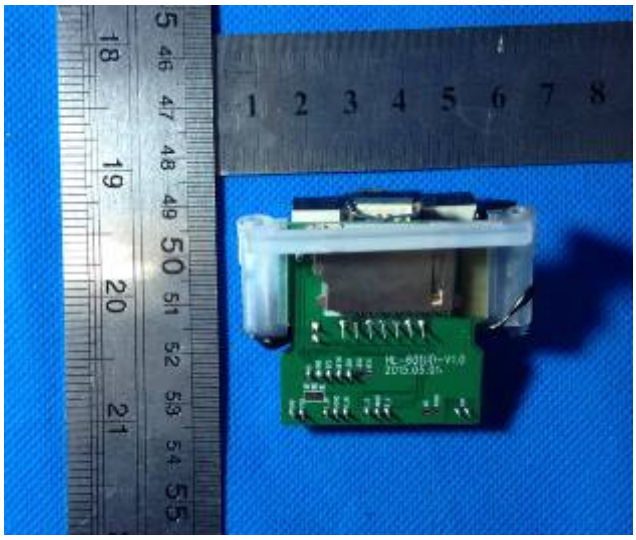


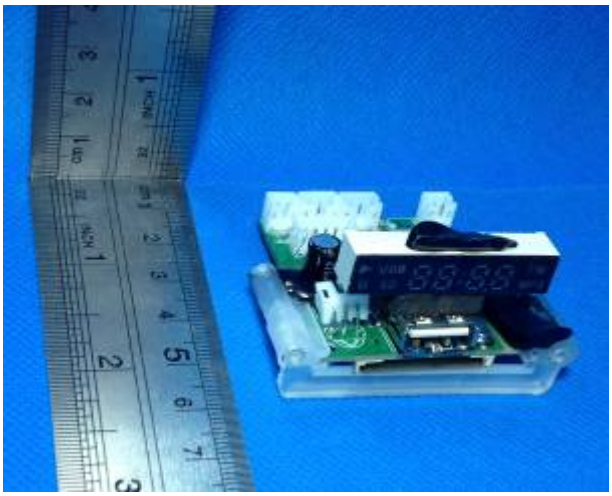


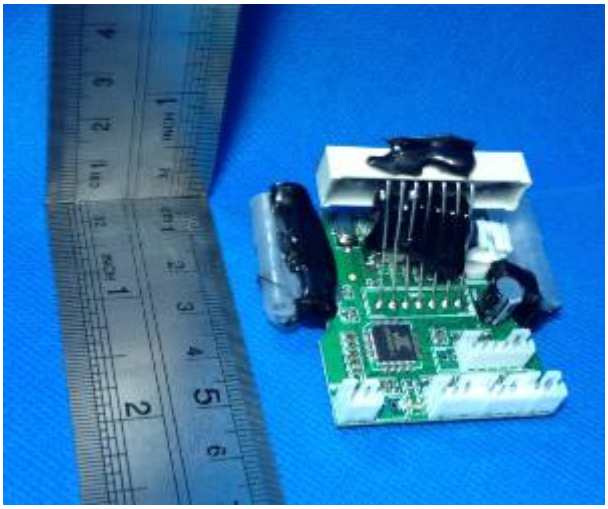


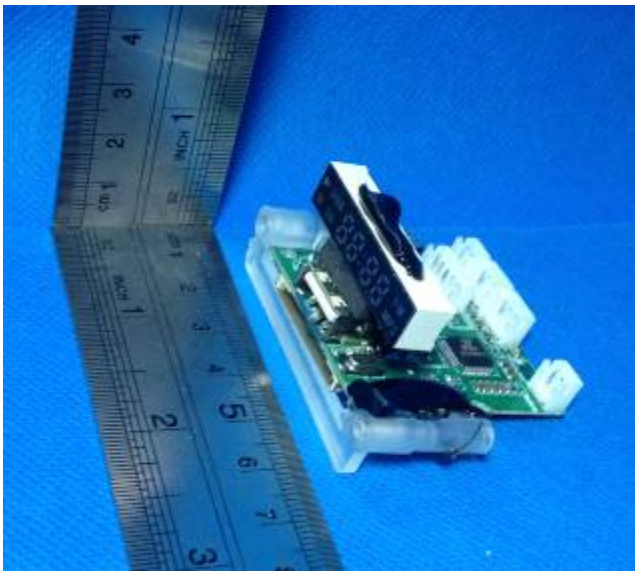


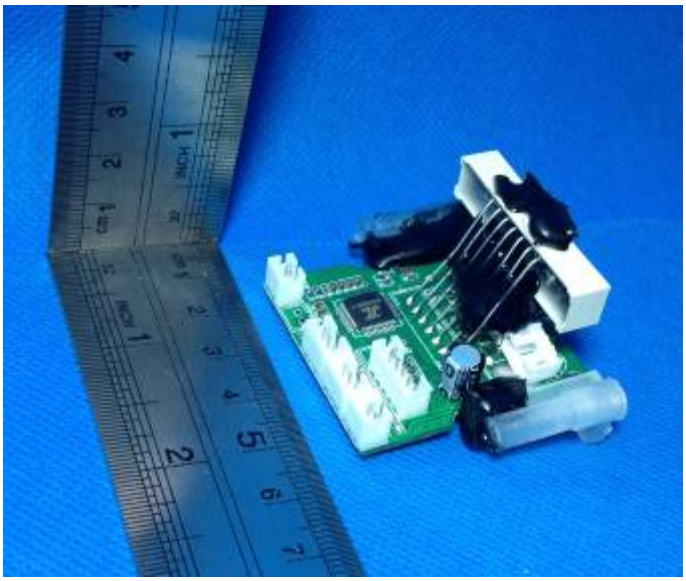


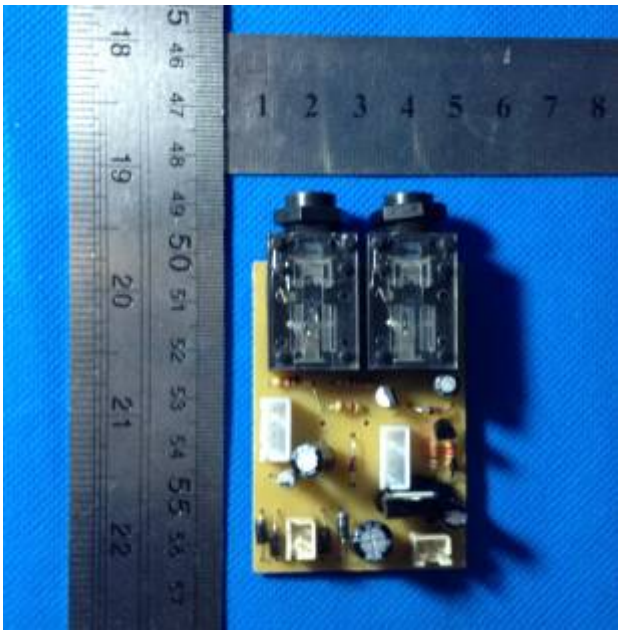


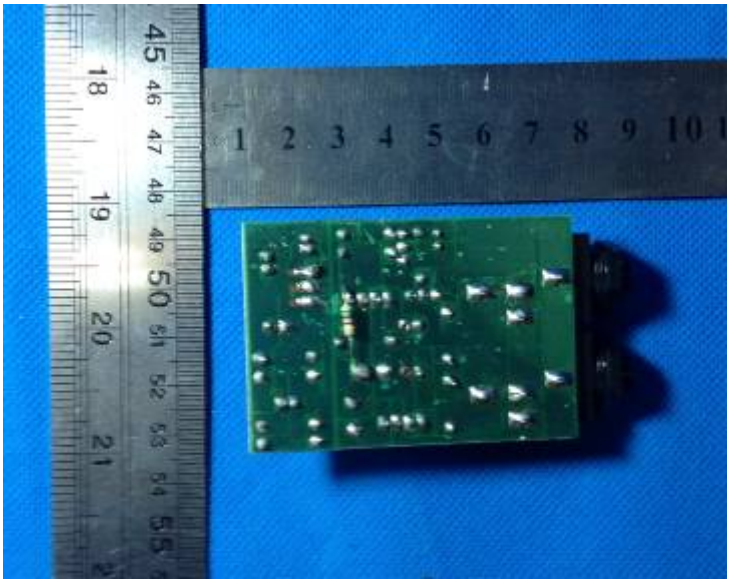


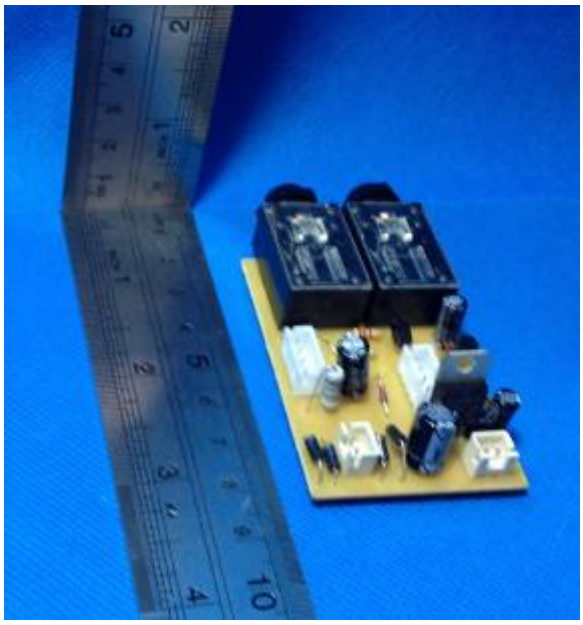


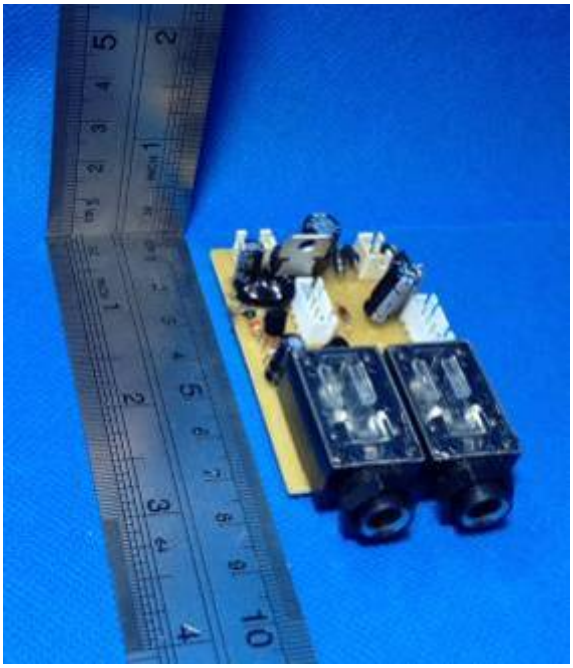


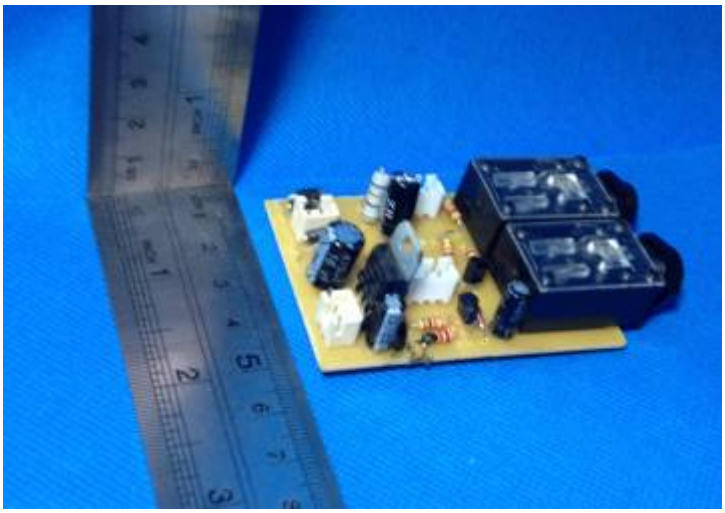


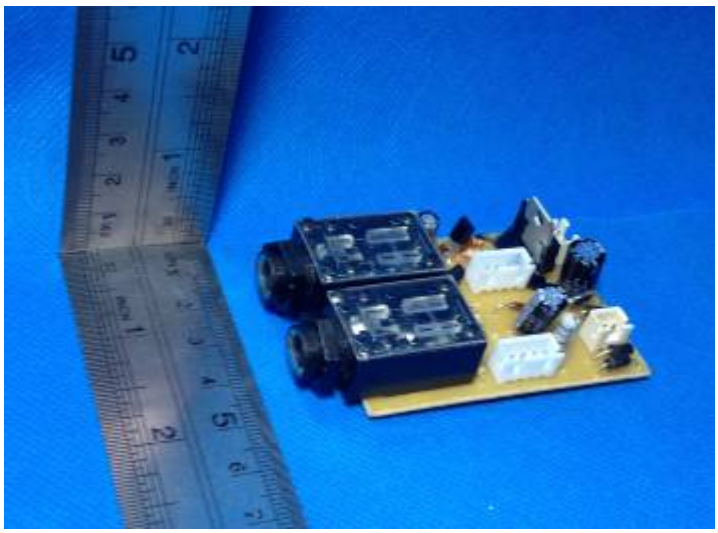


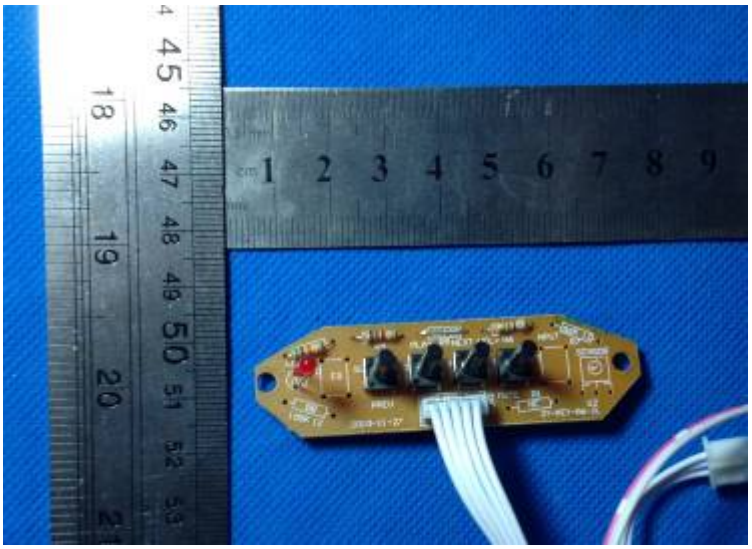


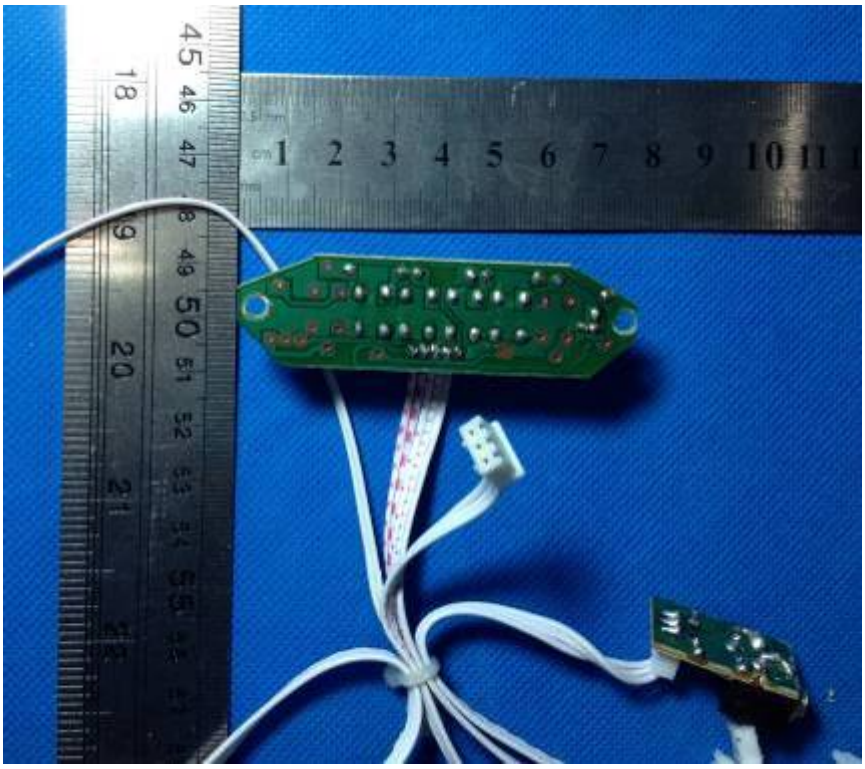


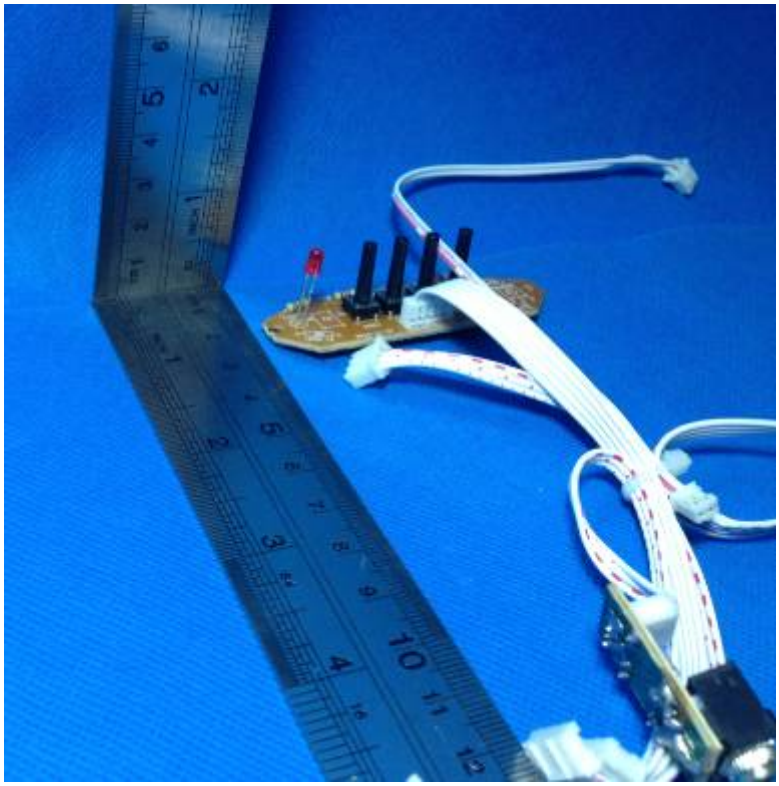


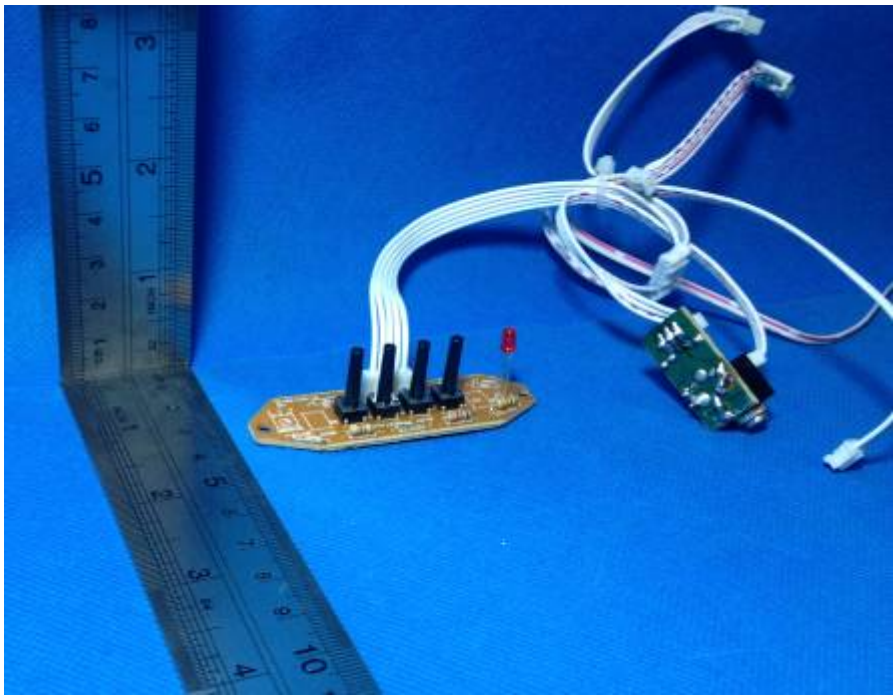


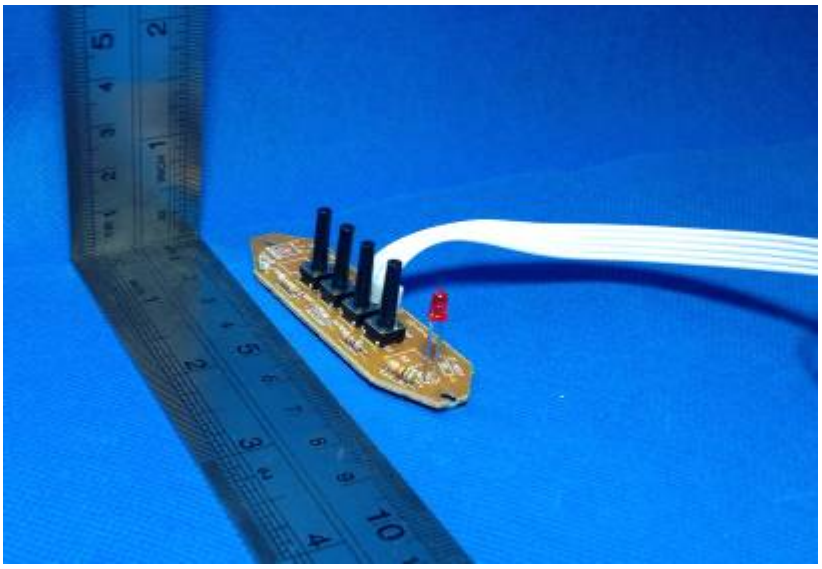


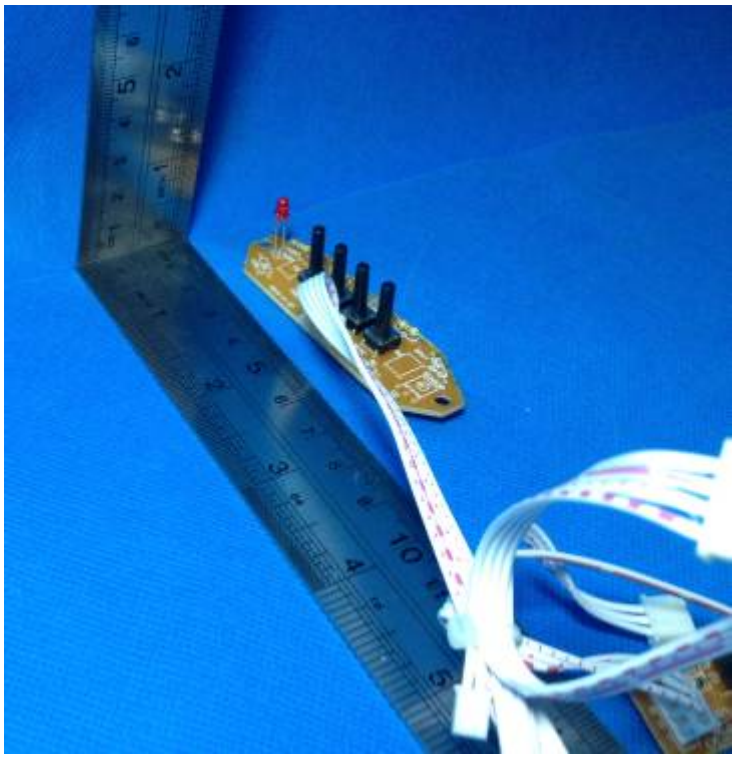


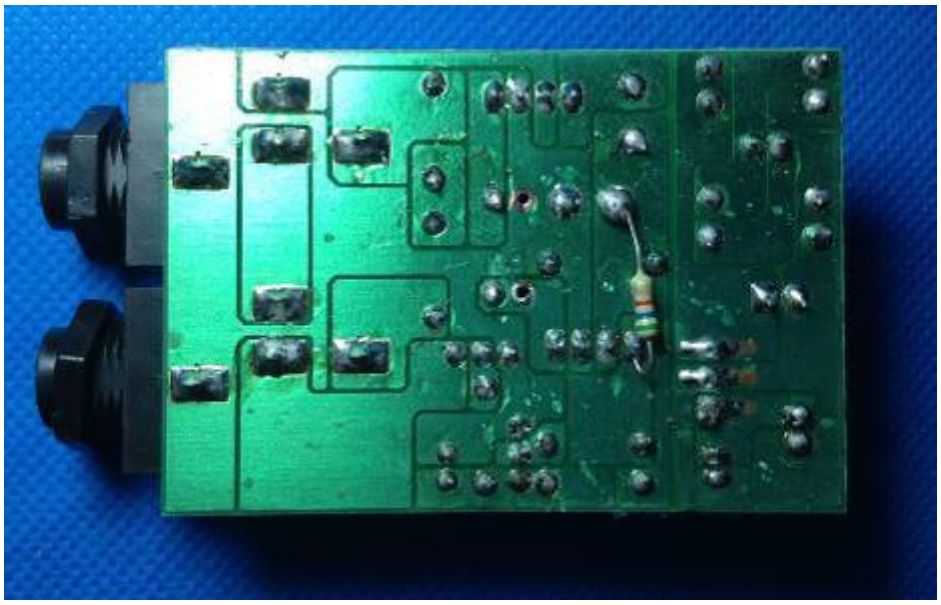




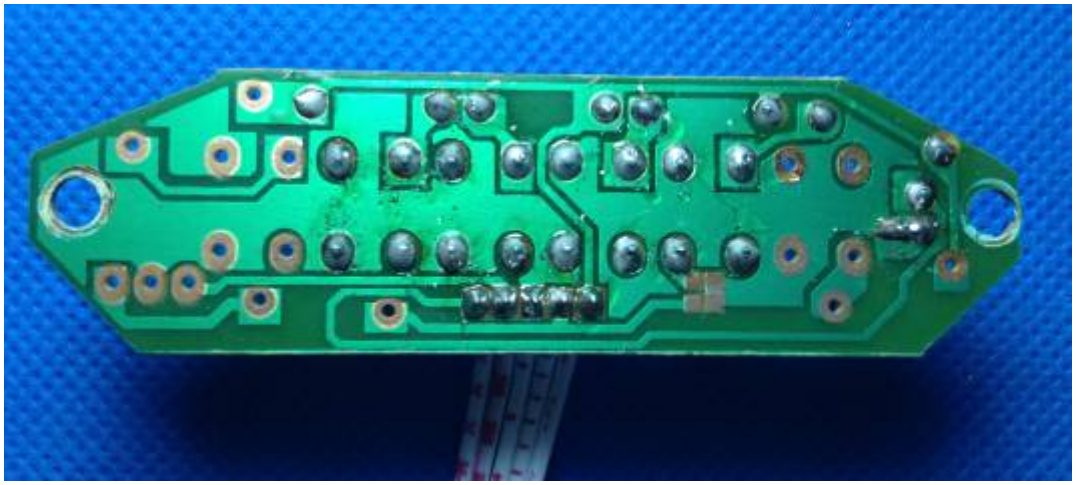


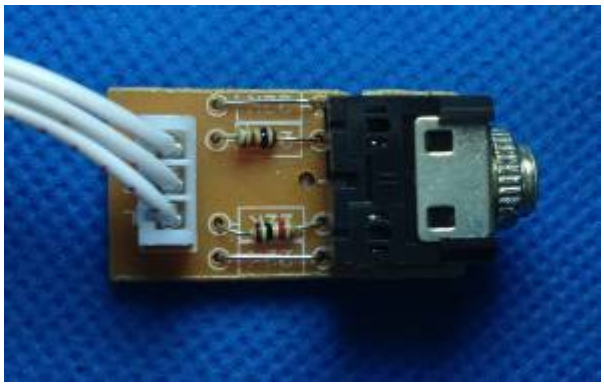


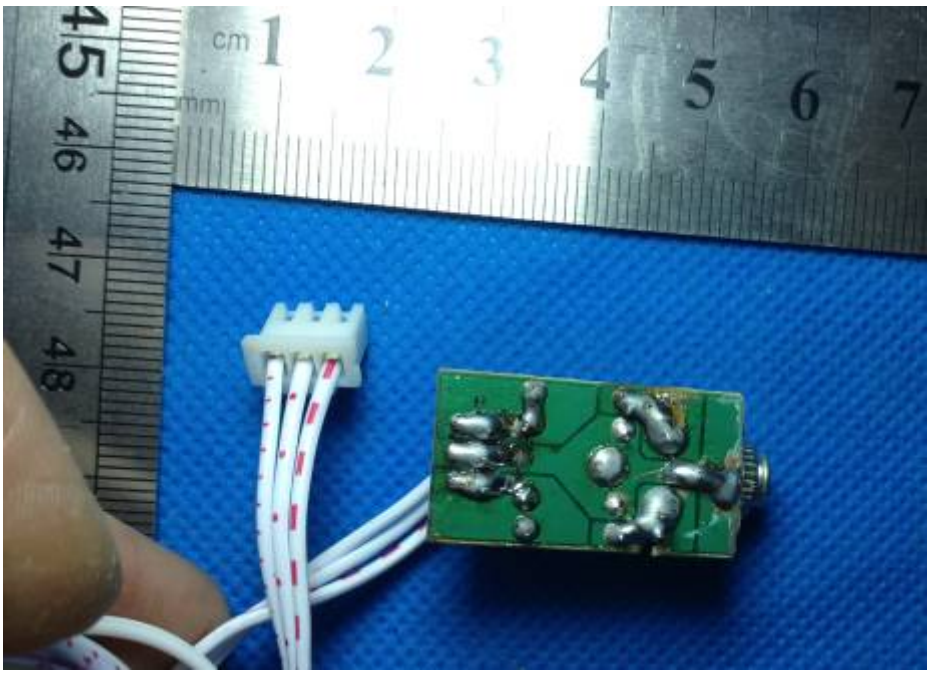


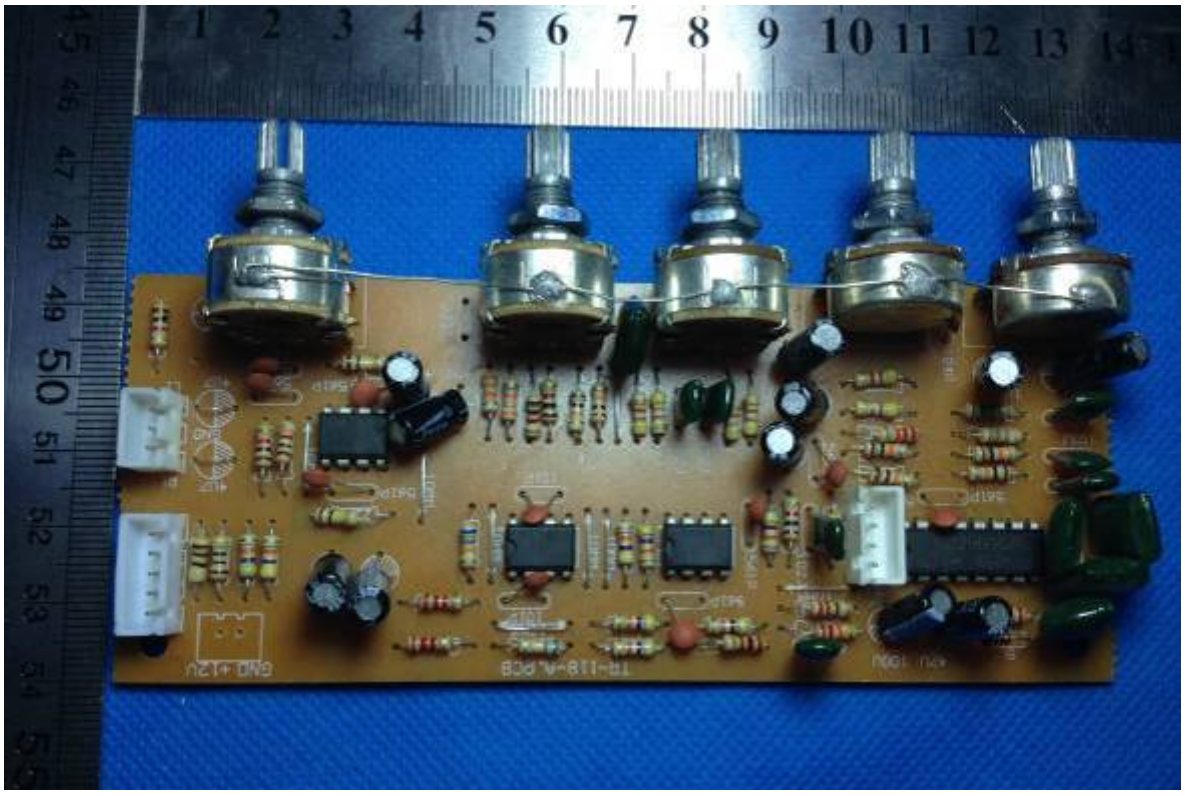


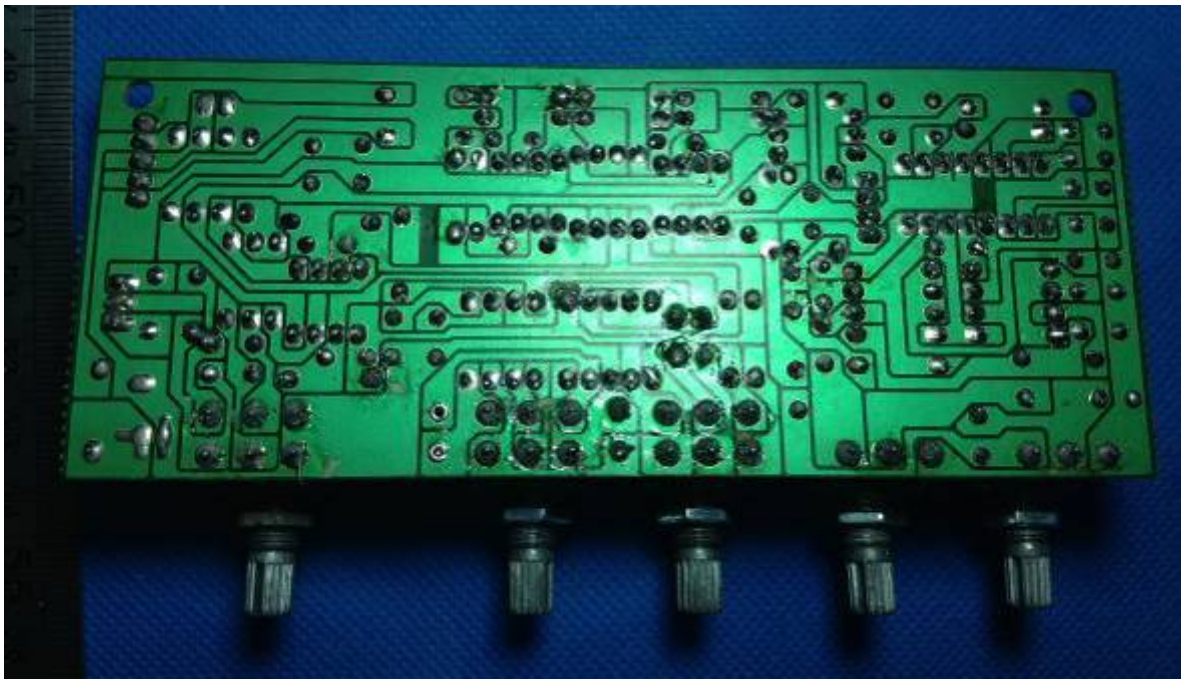

PLAY
R5
NEXT
VOL+
NPUT
56K 1Z
R7
SENSOR
EQ
R8
100K 1Z
2010-11-27
U2
ZY-KEY-R6-JL

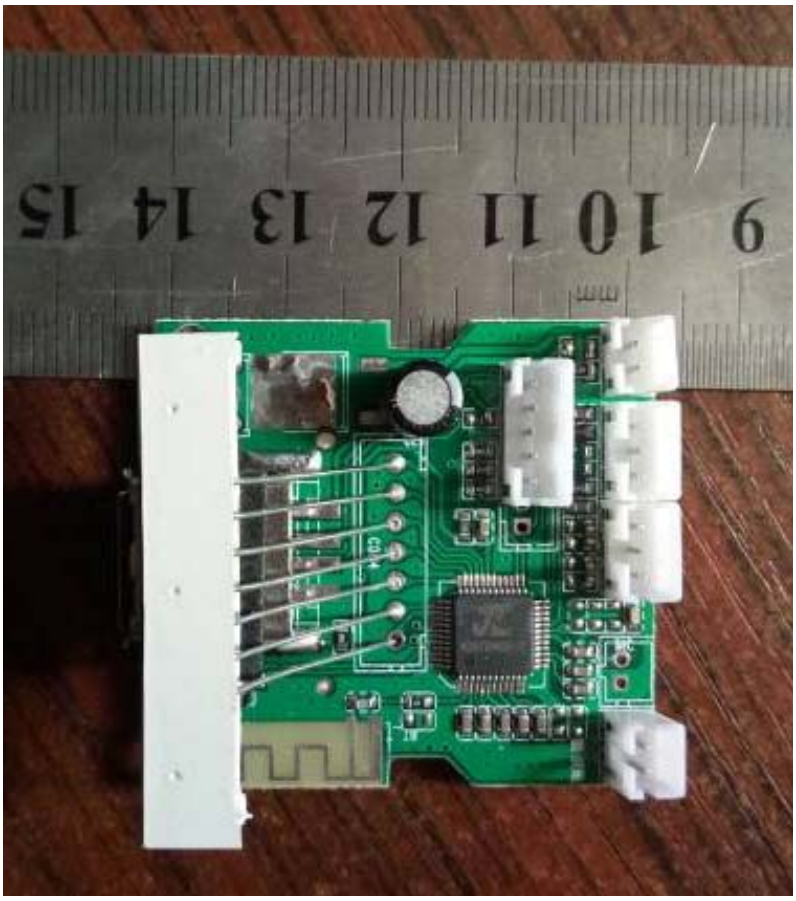





cm
1
2
3
4
5
6
7
45
46
47
48



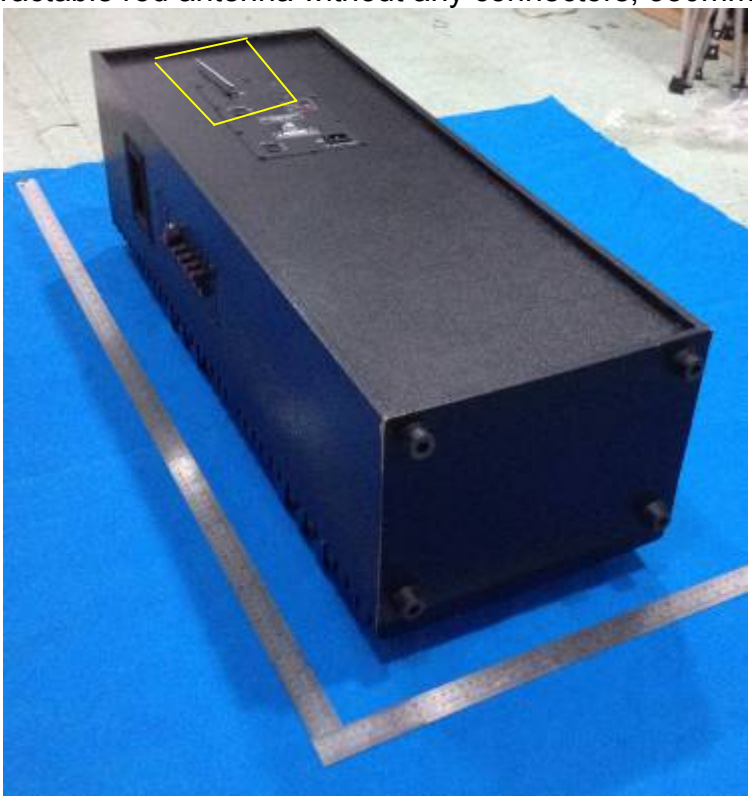


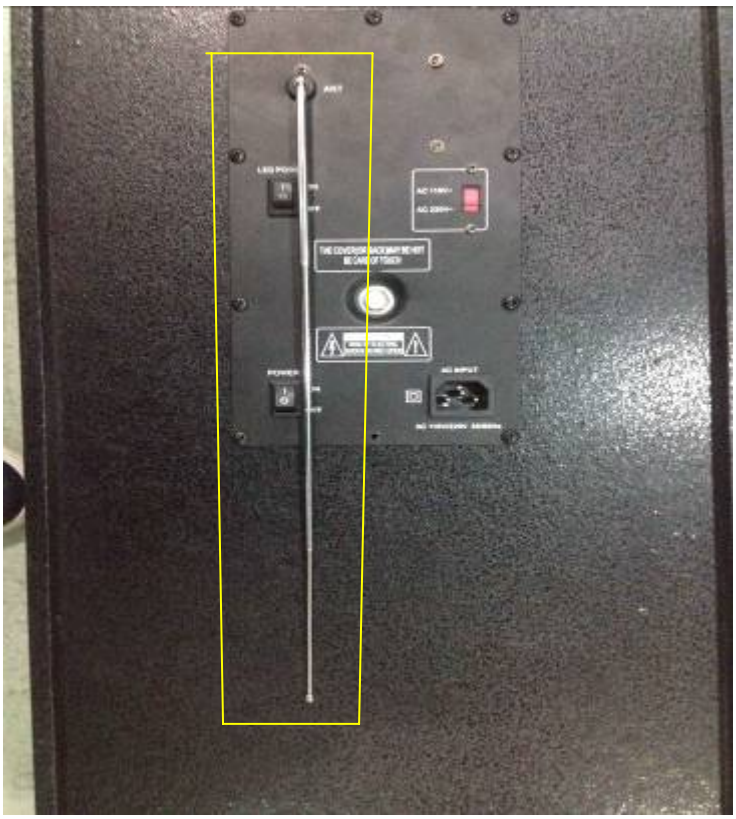



HL-601UB-V1.0
2015.05.01.

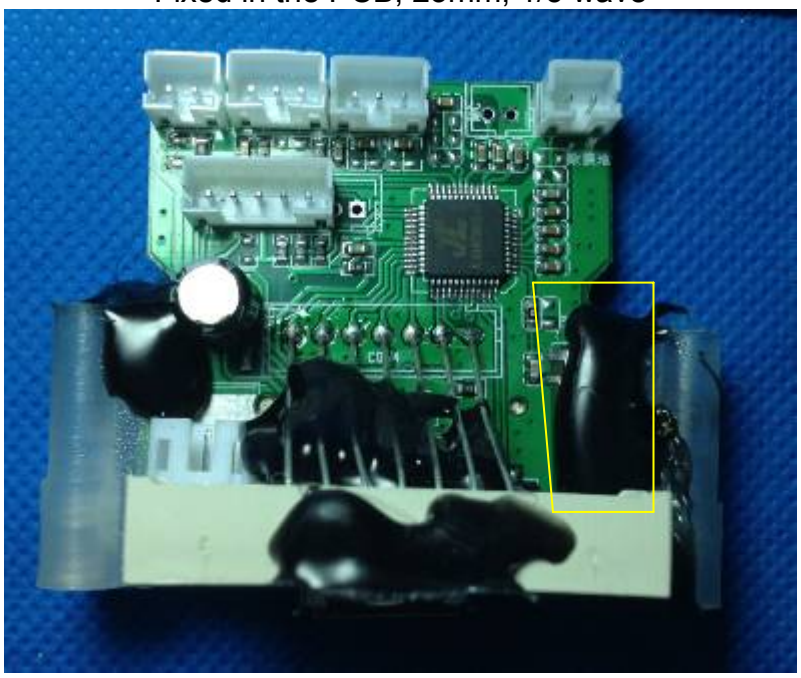
4.3 Antenna Photo

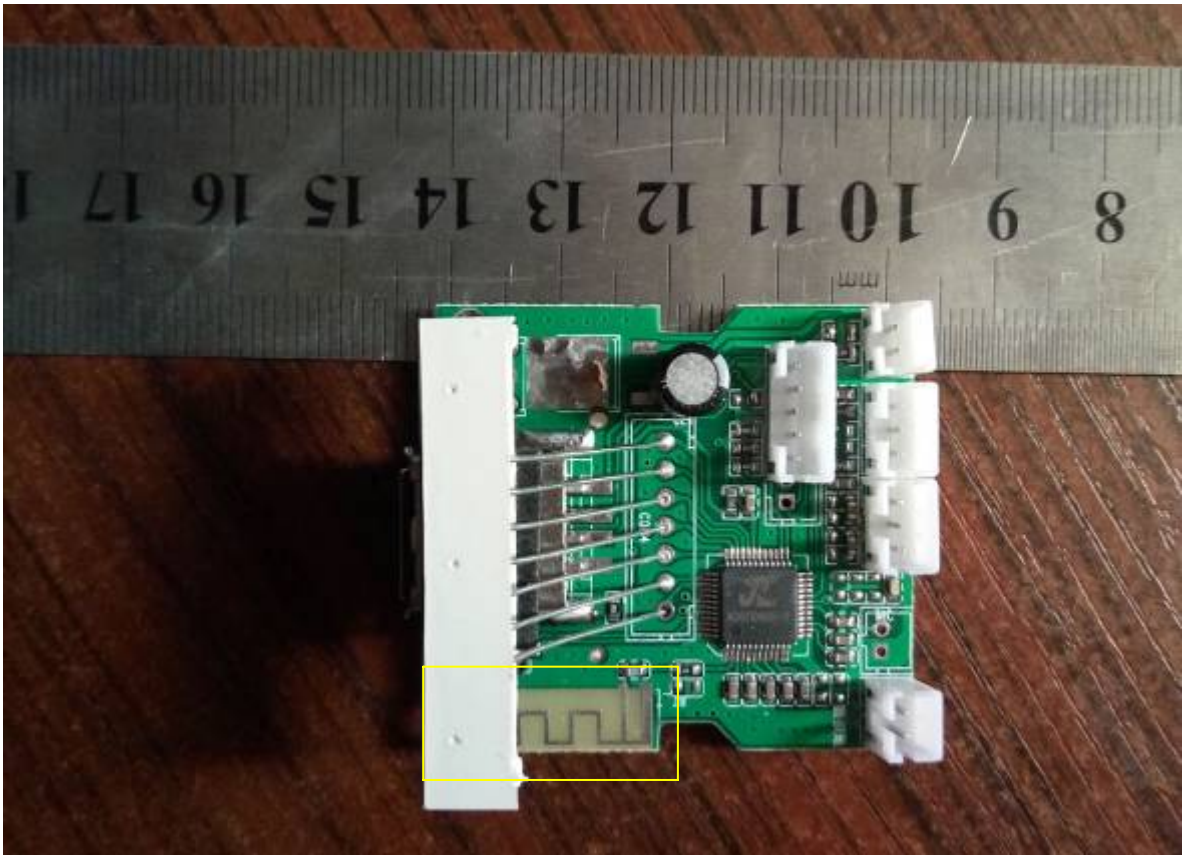
External FM Antenna
One simple retractable rod antenna without any connectors, 350mm, 3 times wave





Internal BT Antenna
Fixed in the PCB, 23mm, 1/5 wave






HL-601UB-V1.0
2015.05.01.

5 EQUIPMENTS USED DURING TEST

Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date	Cal. Due date
1	Antenna	R & S	HF906	/	2015-5-10	2016-5-10
					2016-5-10	2017-5-10
2	3m Semi-anechoic Chamber	ABLATROSS	SAC-3	/	2015-5-10	2016-5-10
					2016-5-10	2017-5-10
3	EMI Receiver	R & S	ESCI-3	/	2015-5-10	2016-5-10
					2016-5-10	2017-5-10
4	Active loop antenna	BJ 2nd Factory	ZN30900A	EMC6001	2013-9-24	2016-9-24
5	Horn Antenna	A-INFOMW	JXTXLB-10180-N	ITL-110	2015-1-24	2018-1-24
6	Pre Amplifier	HP	8447F	ITL-116	2016-1-19	2017-1-19
7	Spectrum Analyzer	Rohde & Schwarz	FSP30	EMC0001	2016-3-24	2017-3-24
8	EMI Test Receiver	Rohde & Schwarz	ESCI	EMC1002	2016-3-24	2017-3-24
9	Shielding room	DG ZongZhou	ZW-391 7x3.9x3 m	EMC1001	2014-5-28	2017-5-28
10	LISN	AFJ	LS16C	EMC1003	2016-1-20	2017-1-20
11	Audio signal generator	HK LONGWEI	TAG-101	EMC0010	2015-10-23	2016-10-23
12	LISN	Rohde & Schwarz	ESH2-Z5	1.005	2015-5-10	2016-5-10
					2016-5-10	2017-5-10
13	Spectrum analyzer	Agilent	E4407B	RF0001	2015-10-25	2016-10-25
14	Test receiver	R & S	ESCI	RF0002	2015-10-25	2016-10-25
15	Bilog antenna	TESEQ	CBL6111D	RF0003	2015-11-25	2016-11-25
16	Horn antenna	Schwarzbeck	BBHA 9120D	RF0004	2016-3-6	2017-3-6
17	Horn antenna	Schwarzbeck	BBHA 9170	RF0005	2016-3-6	2017-3-6
18	50Ω Coaxial switch	Anritsu	MP59B	RF0006	2016-3-6	2017-3-6
19	PreAmplifier	Agilent	8449B	RF0007	2015-10-25	2016-10-25
	Loop Antenna	ARA	PLA-1030/B	RF0008	2015-6-8	2016-6-8
20	Low frequency cable	EM	R01	RF0009	2015-11-5	2016-11-5
21	High frequency cable	Schwarzbeck	AK9515H	RF0010	N/A	N/A
22	USB RF power sensor	DARE	RPR3006W	RF0011	2015-10-25	2016-10-25
23	Spectrum Analyzer	Agilent	E4407B	RF0012	2015-10-25	2016-10-25
24	Sugnal Analyzer	Agilent	N9020A	RF0013	2015-11-18	2016-11-18

End of report