

Test Report

FCC PART 15 Subpart B

Product Name : iPal
Model No. : iPal-B (iPal-P/ iPal-S/ iPal-GD/ iPal-GN)
FCC ID/IC ID : 2APZJ-IPAL/23929-IPAL

Applicant : Nanjing AvatarMind Robot Technology Co., Ltd.
Address : 3 Gutan Road, Gaochun Economic Development Zone,
Nanjing, Jiangsu

Date of Receipt : 26/02/2018
Test Date : 26/03/2018~25/04/2018
Issued Date : 25/04/2018
Report No. : YZ180129-AFDJ-0001-1
Report Version : V1.0

The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

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Test Report Certification

Issued Date : 25/04/2018

Report No. : YZ180129-AFDJ-0001-1

**江苏扬子检验认证有限公司**
Jiangsu Yangtze Testing and Certification Co., Ltd

Product Name : iPal
Applicant : Nanjing AvatarMind Robot Technology Co., Ltd.
Address : 3 Gutan Road, Gaochun Economic Development Zone,
Nanjing, Jiangsu
Manufacturer : Nanjing AvatarMind Robot Technology Co., Ltd.
Address : 3 Gutan Road, Gaochun Economic Development Zone,
Nanjing, Jiangsu
Model No. : iPal-B (iPal-P/ iPal-S/ iPal-GD/ iPal-GN)
Brand Name : AvatarMind
EUT Voltage : +24V, 3.75A
Applicable : FCC 47 CFR FCC Part 15 Subpart B: 2017
Standard : ICES-003 Issue 6-2016 ANSI C63.4-2014
Test Result : Complied
Performed : JIANGSU YANGTZE TESTING, CERTIFICATION AND
Location : INSPECTION CORPORATION
No.6-3, Xingzhi Road, Xingzhi Technology Park
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Laboratory Information

We, **YTC Corporation**, are an independent EMC and safety consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted(audited or listed) by the following related bodies in compliance with ISO 17025 and specified testing scope:

The address and introduction of YTC Corporation's laboratories can be founded in our Web site : <http://www.yztcic.com/>

If you have any comments, Please don't hesitate to contact us.

TABLE OF CONTENTS

1.	General Description	5
1.1	EUT Description	5
1.2	Test Mode.....	8
1.3	Support Units	8
1.4	Applied Standards	8
2.	Technical Test.....	9
2.1	Summary of Test Result	9
2.2	List of Measuring Equipment.....	9
2.3	Measurement Uncertainty	10
3.	Test Result.....	11
3.1	AC Conducted Emission Measurement	11
3.1.1	Limits	11
3.1.2	Test Procedure	11
3.1.3	Block Diagram of Test Setup	12
3.1.4	Test Setup	12
3.1.5	Test Result of AC Conducted Emission	13
3.2	Radiated Emission Measurement	14
3.2.1	Limit.....	14
3.2.2	Test Procedures	14
3.2.3	Block Diagram of Test Setup	15
3.2.4	Test Setup	15
3.2.5	Test Result of Radiated Emission.....	16
4.	Photographs of EUT.....	18

1. General Description

1.1 EUT Description

Product Name	iPal
Brand Name	AvatarMind
Model No.	iPal-B (iPal-P/ iPal-S/ iPal-GD/ iPal-GN)
EUT Voltage	+24V, 3.75A
Frequency Range	For 2.4GHz Band 802.11b/g/n(20MHz): 2412~2462MHz For 5.0GHz Band 802.11a/n/ac(20MHz): 5180~5240MHz, 5745~5825MHz 802.11n/ac(40MHz): 5190~5230MHz, 5755~5795MHz 802.11ac(80MHz): 5210~5775MHz Bluetooth v3.0 + EDR 2402MHz~2480MHz Bluetooth v4.0 + LE 2402MHz~2480MHz
Channel Number	For 2.4GHz Band 802.11b/g/n(20MHz): 11 For 5.0GHz Band 802.11a/n/ac(20MHz): 9 802.11n/ac(40MHz): 4 802.11ac(80MHz):2 Bluetooth v3.0 + EDR: 79 Bluetooth v4.0 + LE: 40
Type of Modulation	802.11b: DSSS 802.11a/g/n/ac: OFDM Bluetooth v3.0 + EDR: GFSK, $\pi/4$ -DQPSK, 8-DPSK Bluetooth v4.0 + LE: GFSK
Data Rate	802.11a/g: 6/9/12/18/24/36/48/54 Mbps 802.11b: 1/2/5.5/11 Mbps 802.11n: up to 300 Mbps 802.11ac: MCS 0/1/2/3/4/5/6/7/8/9 Bluetooth v3.0 + EDR: 1/2/3 Mbps Bluetooth v4.0 + LE: 1Mbps
Channel Control	Auto
Antenna Delivery	Tx + Rx
Antenna Type	Integral antenna

Peak Antenna Gain	2dBi
Components	
Adapter	Brand Name: Channel Well Technology Model: 2AAL090m Input: 100-240V~1.5 A 50/60Hz Output: 24V, 3.75A

For 2.4GHz Band

802.11b/g/n(20MHz) Working Frequency of Each Channel:							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
01	2412 MHz	02	2417 MHz	03	2422 MHz	04	2427 MHz
05	2432 MHz	06	2437 MHz	07	2442 MHz	08	2447 MHz
09	2452 MHz	10	2457 MHz	11	2462 MHz	N/A	N/A

For 5.0GHz Band

802.11a/n/ac(20MHz) Working Frequency of Each Channel:							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180 MHz	40	5200 MHz	44	5220 MHz	48	5240 MHz
149	5745 MHz	153	5765 MHz	157	5785 MHz	161	5805 MHz
165	5825 MHz	N/A	N/A	N/A	N/A	N/A	N/A

802.11n/ac(40MHz) Working Frequency of Each Channel:							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz	151	5755 MHz	159	5795 MHz

802.11ac(80MHz) Working Frequency of Each Channel:							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
42	5210MHz	155	5775MHz	N/A	N/A	N/A	N/A

For Bluetooth v3.0 + EDR Band

802.11b/g/n(20MHz) Working Frequency of Each Channel:							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
00	2402 MHz	39	2441MHz	78	2480 MHz	N/A	N/A

For Bluetooth v4.0 + LE Band

802.11b/g/n(20MHz) Working Frequency of Each Channel:							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
00	2402 MHz	19	2440MHz	39	2480 MHz	N/A	N/A

802.11a/b/g/n Antenna List

Antenna	Manufacturer	Model No.	Peak Gain
Antenna 1	N/A	N/A	2dBi for 2.4GHz, 1dBi for 5GHz

1.2 Test Mode

YTC has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Emission	Conducted Emission	Charging Mode
	Radiated Emission	Action Mode

1.3 Support Units

No.	Name	Model No.	Serial No.	Trade Name
1	PC	B41	/	Lenovo

NOTE:

- 1) All the equipment were placed in the worst-case configuration to maximize the emission during the test.
- 2) Grounding was established in accordance with the manufacture's requirements and conditions for the intended use.

1.4 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards: FCC 47 CFR FCC Part 15 Subpart B and ICES-003 Issue 6-2016 ANSI C63.4-2014

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

2. Technical Test

2.1 Summary of Test Result

Number	Standard	Test Item	Result	Minimum Requirement
1	FCC Part 15 B ICES-003	AC Power Line Conducted Emission	Pass	Class B
2	FCC Part 15 B ICES-003	Radiated Emission	Pass	Class B

2.2 List of Measuring Equipment

Continuous disturbance Test				
Name	Model	Manufactory	Equipment No.	Next calibration date
Shielding Room No. 2	8m*4m*3m	EMC	YZTCIC-SB-0581	2020/8
Receiver	ESCI	R&S	YZTCIC-SB-0368	2018/10
LISN	ENV216	R&S	YZTCIC-SB-0630	2018/10

Radiated disturbance Test				
Name	Model	Manufactory	Equipment No.	Next calibration date
3M Semi-anechoic Chamber	9m*6m*6m	EMC	YZTCIC-SB-0579	2020/7
EMI Receiver	ESR7	R&S	YZTCIC-SB-0412	2018/10
Ultralog Antenna	HL562E	R&S	YZTCIC-SB-0595	2019/2
Broad-Band Horn Antenna	HF907	R&S	YZTCIC-SB-0596	2018/11

2.3 Measurement Uncertainty

Conducted disturbance at mains terminals
The maximum measurement uncertainty is evaluated as: 9kHz~30MHz: $\pm 2.02\text{dB}$
Radiated disturbance
The maximum measurement uncertainty is evaluated as: 30MHz~1GHz: $\pm 3.8\text{dB}$ Above 1GHz: $\pm 4.08\text{dB}$

3. Test Result

3.1 AC Conducted Emission Measurement

3.1.1 Limits

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30MHz shall not exceed the limits in the following table.

Limits for class B Equipment

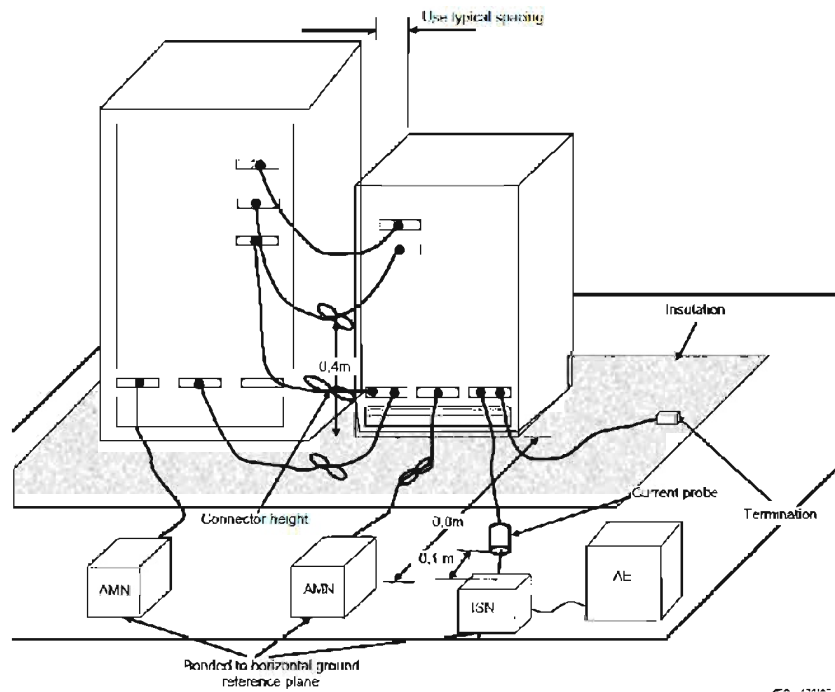
Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0.15~0.50	66~56	56~46
0.50~5	56	46
5~30	60	50

*Decreases with the logarithm of the frequency.

3.1.2 Test Procedure

1. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 10 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

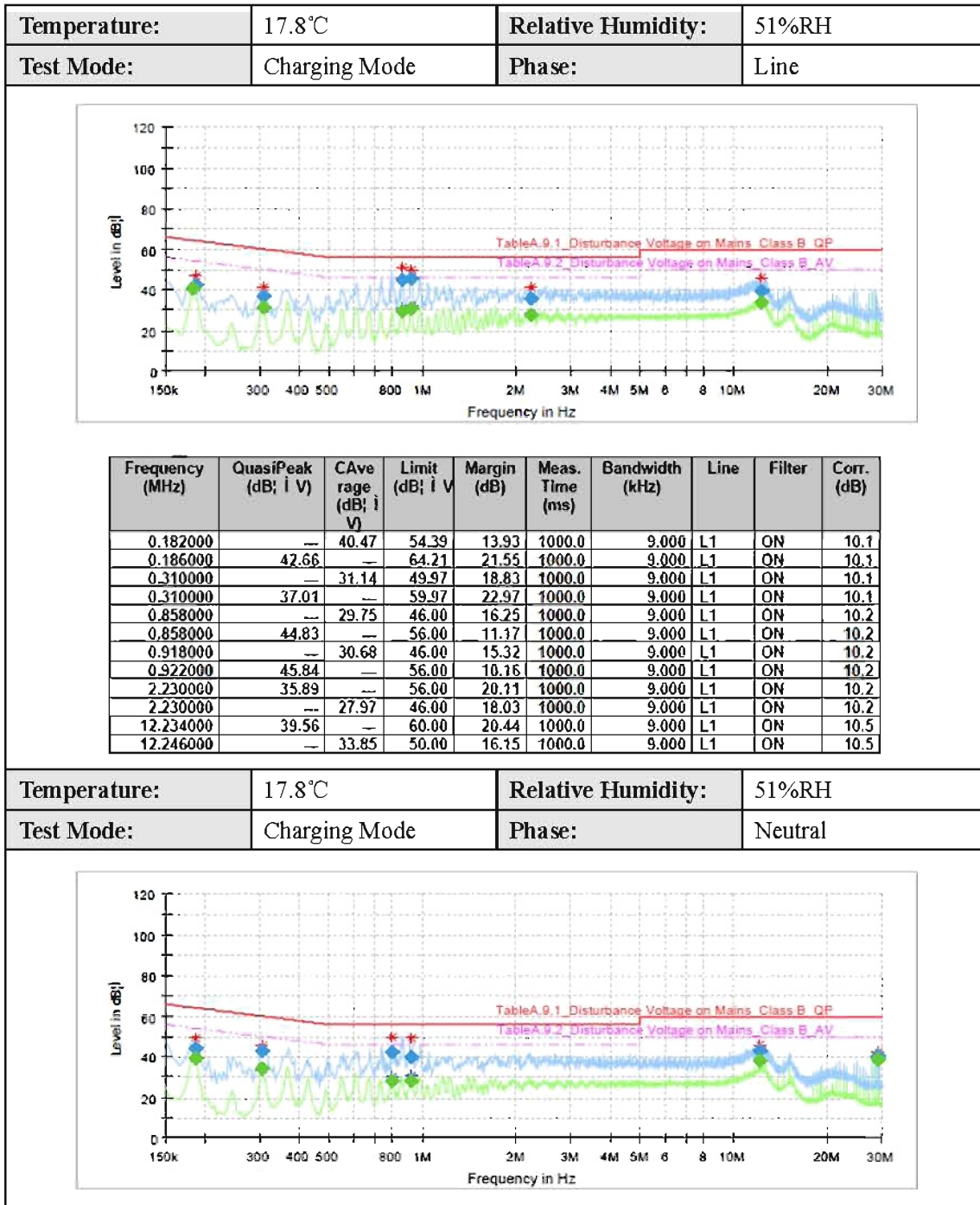
3.1.3 Block Diagram of Test Setup



3.1.4 Test Setup



3.1.5 Test Result of AC Conducted Emission



Frequency (MHz)	QuasiPeak (dB; i V)	CAverage (dB; i V)	Limit (dB; i V)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.186000	---	39.32	54.21	14.89	1000.0	9.000	N	ON	10.1
0.186000	44.10	---	64.21	20.11	1000.0	9.000	N	ON	10.1
0.306000	---	34.76	50.08	15.32	1000.0	9.000	N	ON	10.1
0.306000	42.79	---	60.08	17.29	1000.0	9.000	N	ON	10.1
0.794000	---	28.39	46.00	17.61	1000.0	9.000	N	ON	10.2
0.794000	42.68	---	56.00	13.32	1000.0	9.000	N	ON	10.2
0.922000	39.77	---	56.00	16.23	1000.0	9.000	N	ON	10.2
0.922000	---	28.32	46.00	17.68	1000.0	9.000	N	ON	10.2
12.134000	43.09	---	60.00	16.91	1000.0	9.000	N	ON	10.5
12.134000	---	38.32	50.00	11.68	1000.0	9.000	N	ON	10.5
28.894000	---	38.48	50.00	11.52	1000.0	9.000	N	ON	10.8
28.894000	40.55	---	60.00	19.45	1000.0	9.000	N	ON	10.8

3.2 Radiated Emission Measurement

3.2.1 Limit

The emissions from an unintentional radiator shall not exceed the field strength levels specified in the following table:

Limits for class B Equipment (Below 1GHz)

Frequency (MHz)	Field Strength Limit (μV/m) Q.P.	Quasi-peak limits at 3m (dBμV/m)
30~88	100	40
88~216	150	43.5
216~960	200	46
Above 960	500	54

Limits for class B Equipment (Above 1GHz)

Frequency (MHz)	limits at 3m(dBμV/m)	
	Average	Peak
Above 1000	54	74

NOTE:

- 1) The lower limit shall apply at the transition frequencies.
- 2) Emission level (dBμV/m) = 20 log Emission level (μV/m).

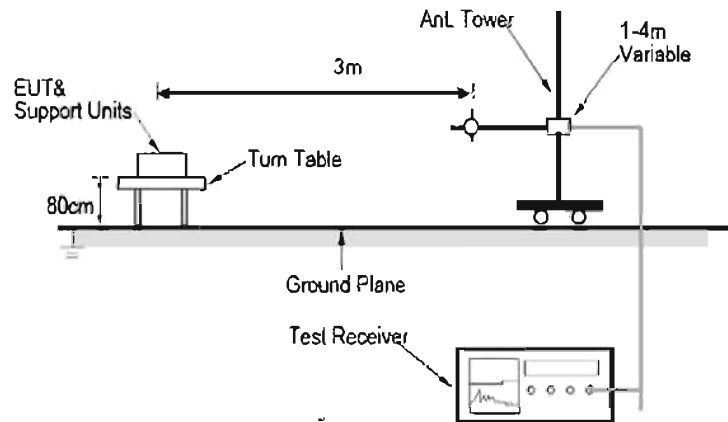
3.2.2 Test Procedures

1. The EUT was placed on a turntable with 0.1 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna's height is adjusted between one to four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarizantal of the antenna.

5. 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 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
7. For measurement below 1GHz, if the emission level of the EUT in peak mode was 3dB lower than the limit specified, peak values of EUT will be reported. Otherwise, the emission will be repeated by using the quasi-peak method and reported.
8. Corrected Reading: Antenna Factor+Cable Loss+Read Level-Preamp Factor=Level

3.2.3 Block Diagram of Test Setup

3.2.4



3.2.5 Test Setup



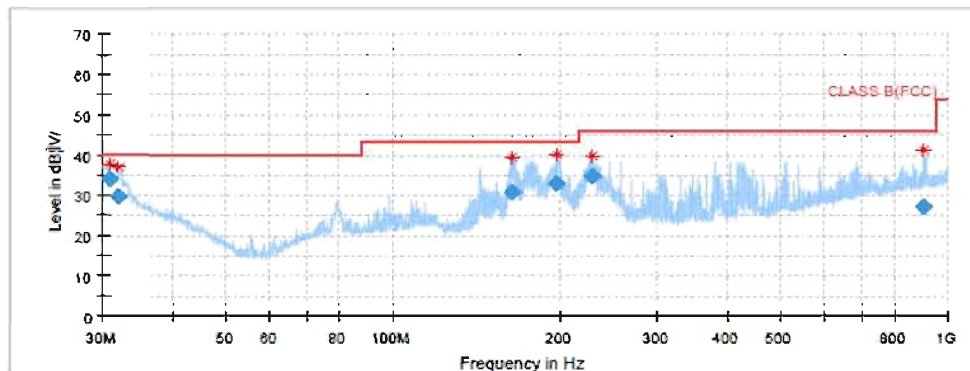
Above 1GHz



3.2.6 Test Result of Radiated Emission

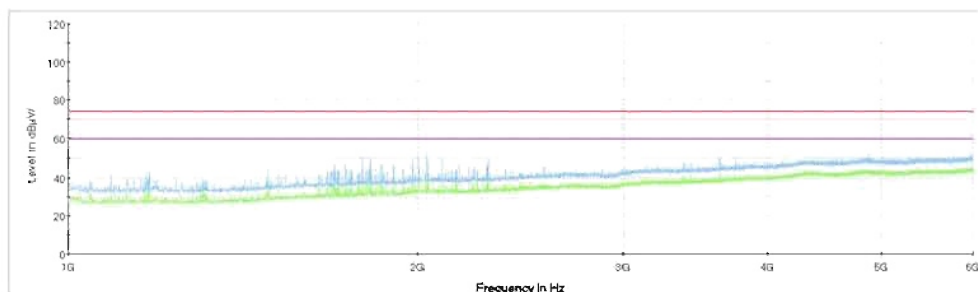
Temperature:	16.8°C	Relative Humidity:	53%RH
Test Mode:	Action Mode	Polarization:	Horizontal

Below 1GHz:



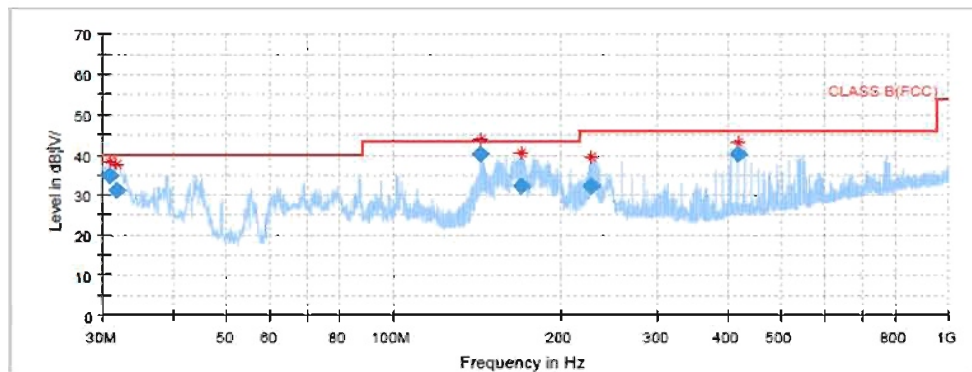
Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.970000	33.93	40.00	6.07	1000.0	120.000	300.0	H	0.0	19.0
32.037000	29.77	40.00	10.23	1000.0	120.000	300.0	H	169.0	18.5
164.684500	30.91	43.50	12.59	1000.0	120.000	200.0	H	145.0	10.2
197.713000	33.09	43.50	10.41	1000.0	120.000	200.0	H	16.0	9.2
228.365000	34.84	46.00	11.16	1000.0	120.000	200.0	H	94.0	10.5
903.194000	27.39	46.00	18.61	1000.0	120.000	100.0	H	124.0	22.1

Above 1GHz:



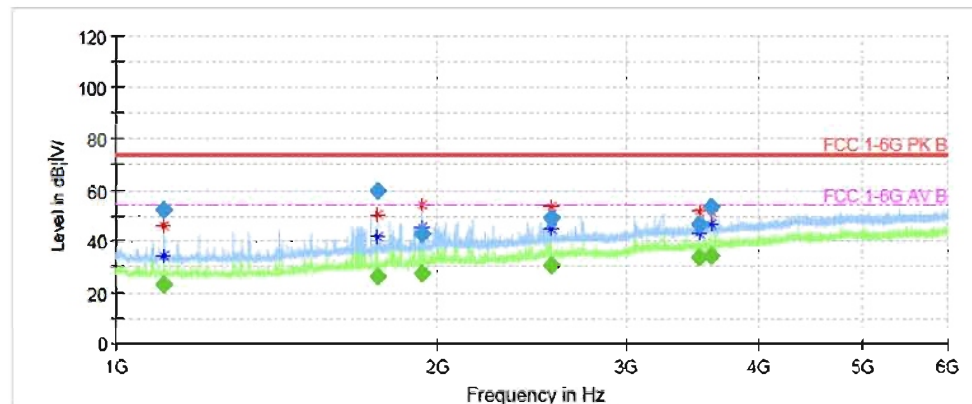
Temperature:	16.8°C	Relative Humidity:	53%RH
Test Mode:	Action Mode	Polarization:	Horizontal

Below 1GHz:



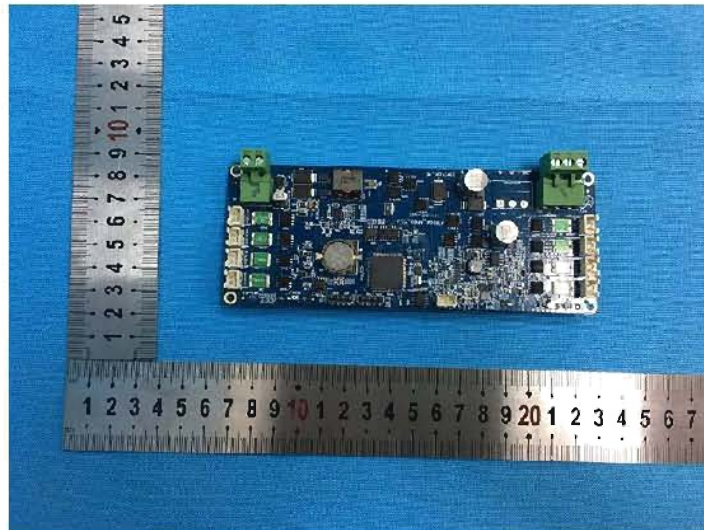
Frequency (MHz)	QuasiPeak (dB; μ V/m)	Limit (dB; μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.921500	34.85	40.00	5.15	1000.0	120.000	300.0	V	295.0	19.1
31.649000	31.36	40.00	8.64	1000.0	120.000	300.0	V	0.0	18.7
143.975000	40.10	43.50	3.40	1000.0	120.000	100.0	V	346.0	10.0
170.504500	32.27	43.50	11.23	1000.0	120.000	200.0	V	346.0	12.1
228.316500	32.29	46.00	13.71	1000.0	120.000	100.0	V	2.0	10.5
417.757500	40.29	46.00	5.71	1000.0	120.000	100.0	V	145.0	15.1

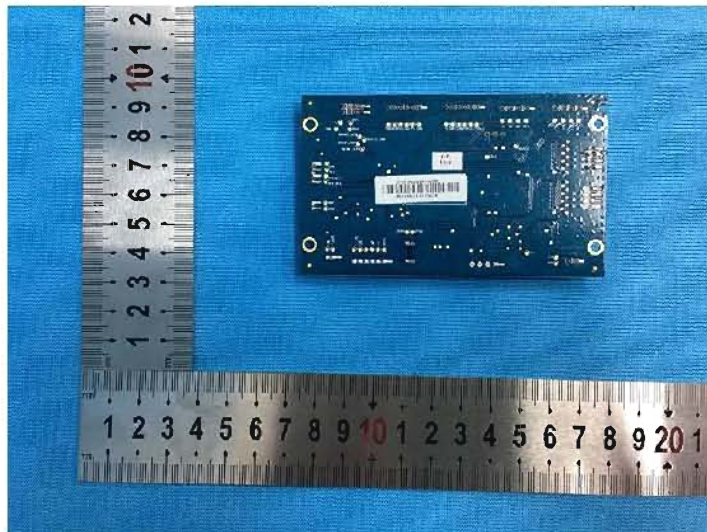
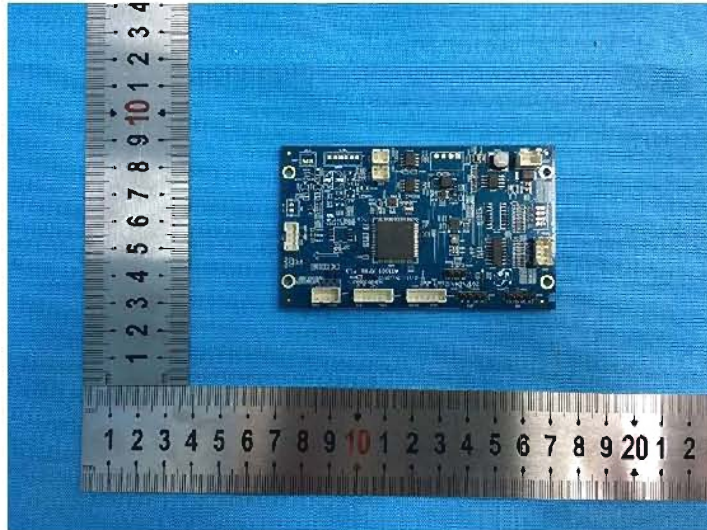
Above 1GHz:

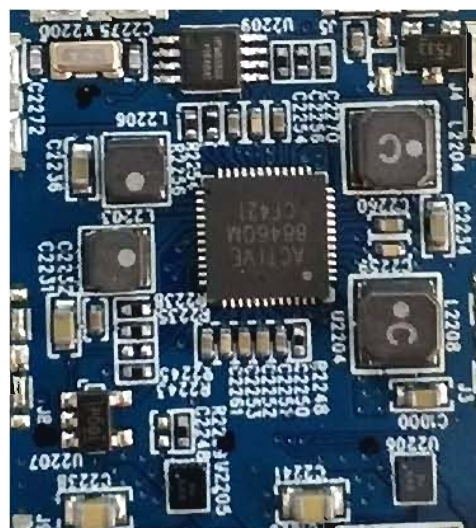


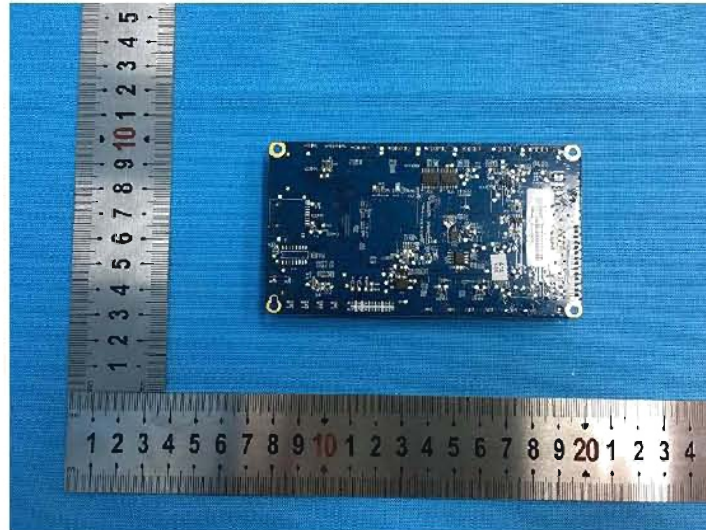
Frequency (MHz)	MaxPeak (dB; μ V/m)	CAverage (dB; μ V/m)	Limit (dB; μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
1109.500000	—	23.22	54.00	30.78	1000.0	1000.000	100.0	V	119.0
1109.500000	52.27	—	74.00	21.73	1000.0	1000.000	100.0	V	119.0
1757.500000	—	26.67	54.00	27.33	1000.0	1000.000	100.0	V	167.0
1758.000000	59.48	—	74.00	14.52	1000.0	1000.000	100.0	V	167.0
1934.500000	—	27.52	54.00	26.48	1000.0	1000.000	100.0	V	348.0
1934.500000	43.20	—	74.00	30.80	1000.0	1000.000	100.0	V	348.0
2551.000000	—	30.63	54.00	23.37	1000.0	1000.000	100.0	V	186.0
2551.000000	48.95	—	74.00	25.05	1000.0	1000.000	100.0	V	186.0
3515.000000	46.97	—	74.00	27.03	1000.0	1000.000	100.0	V	108.0
3515.500000	—	33.89	54.00	20.11	1000.0	1000.000	100.0	V	108.0
3602.000000	—	34.19	54.00	19.82	1000.0	1000.000	100.0	V	351.0
3602.000000	53.28	—	74.00	20.72	1000.0	1000.000	100.0	V	351.0

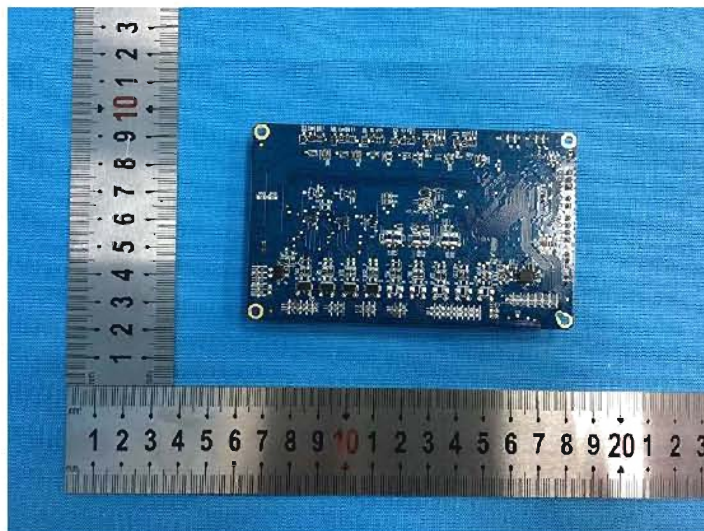
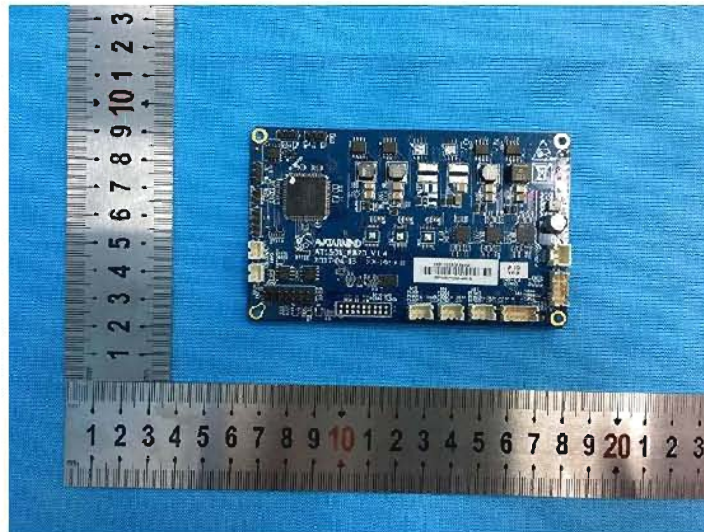
4. Photographs of EUT

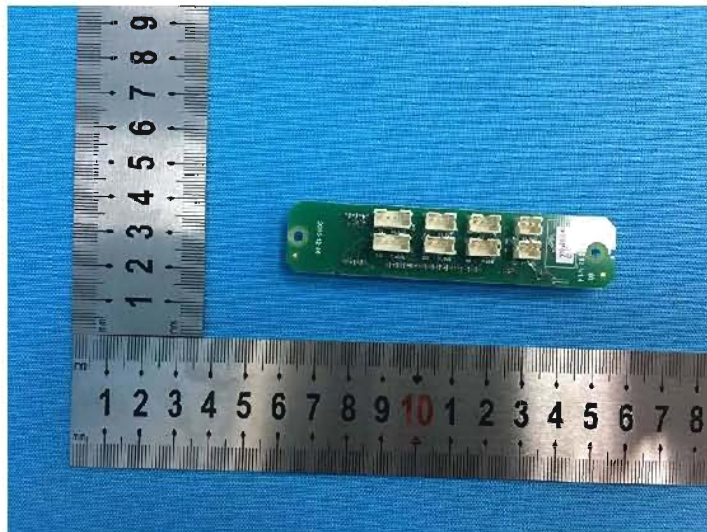
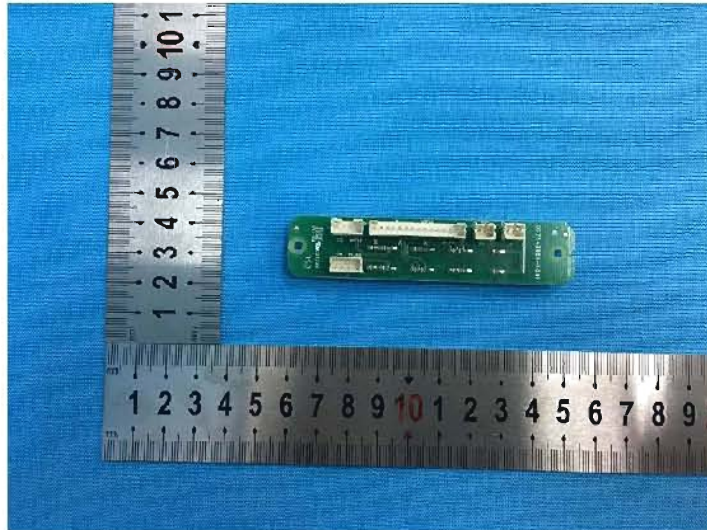


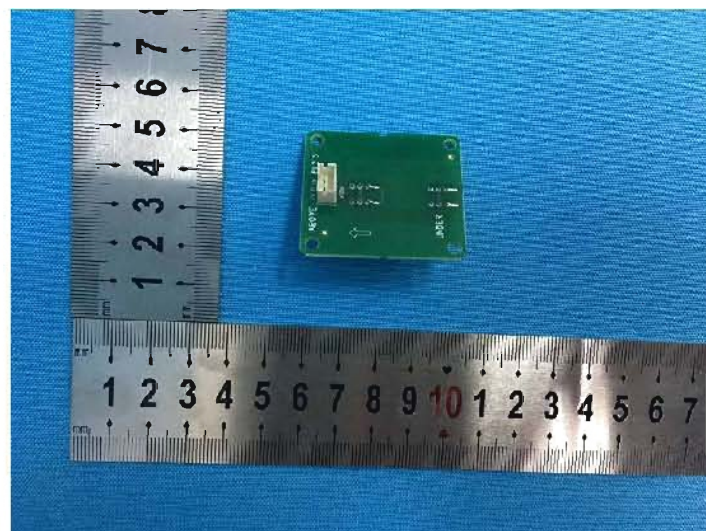
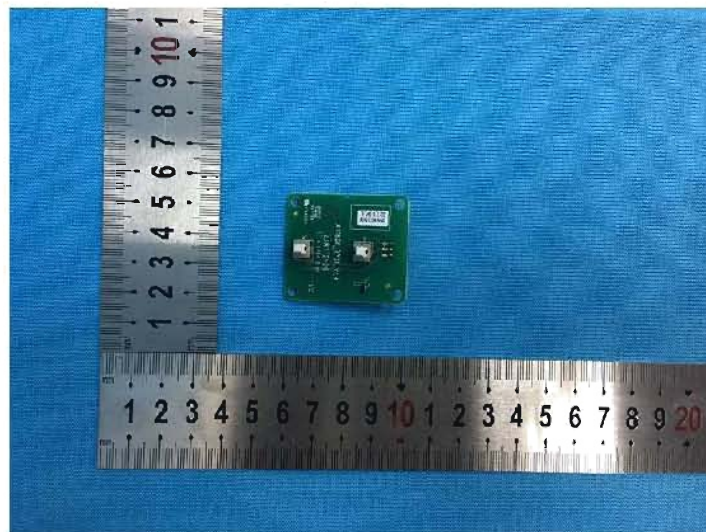
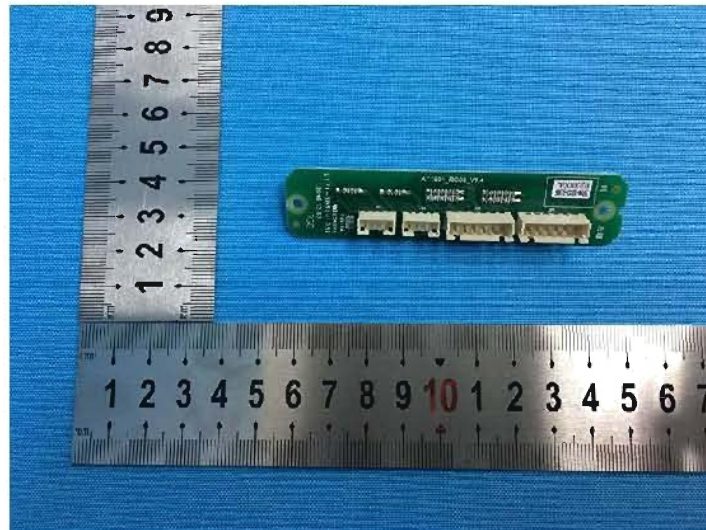


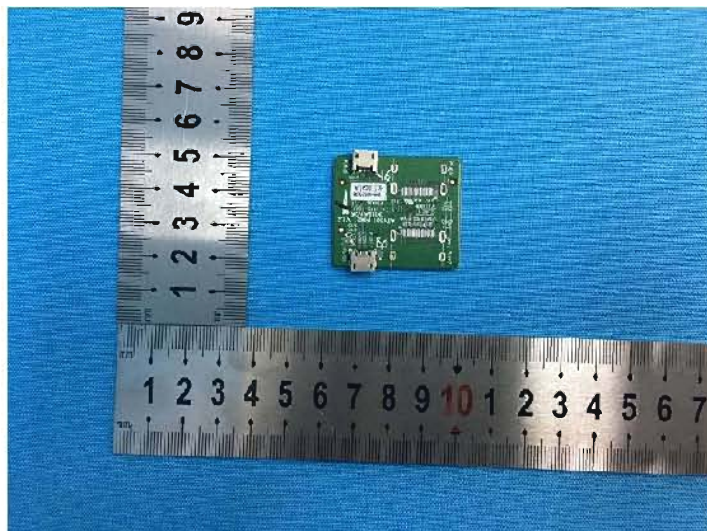
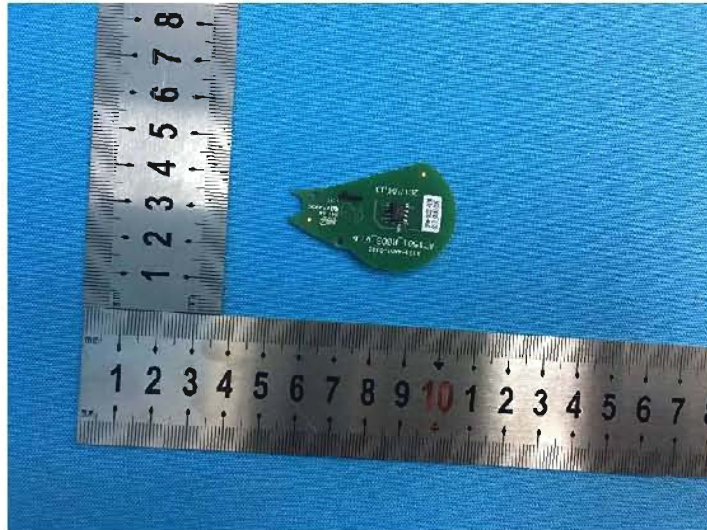


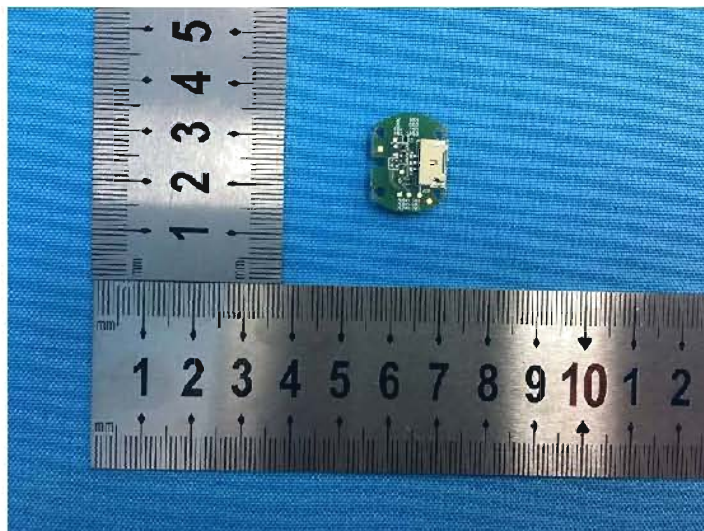
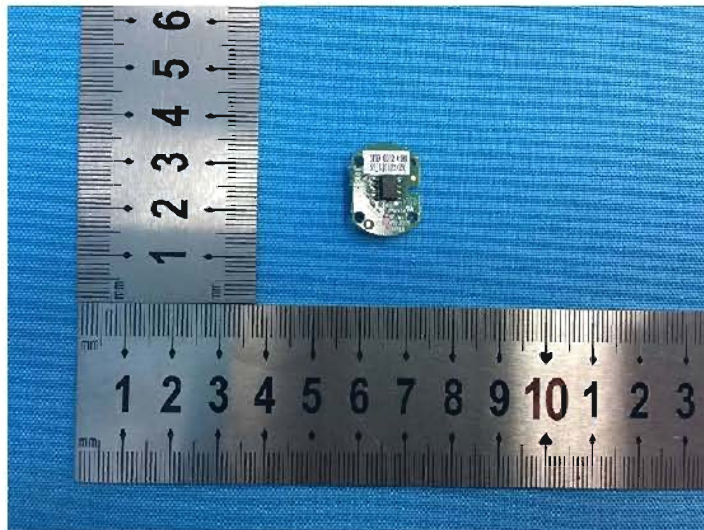
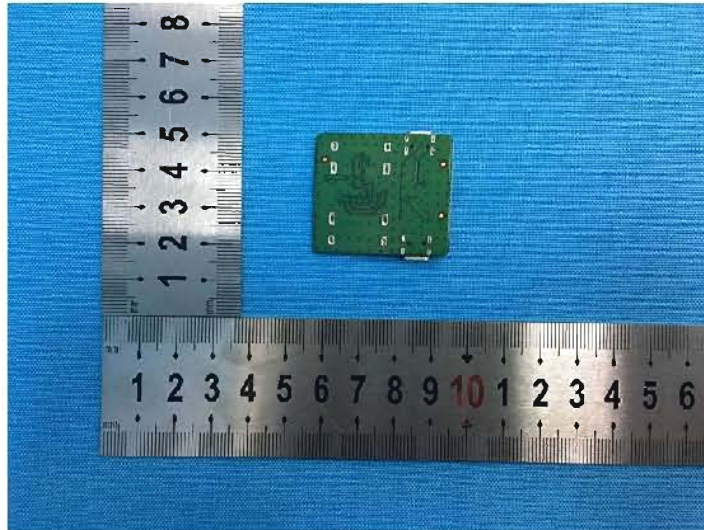


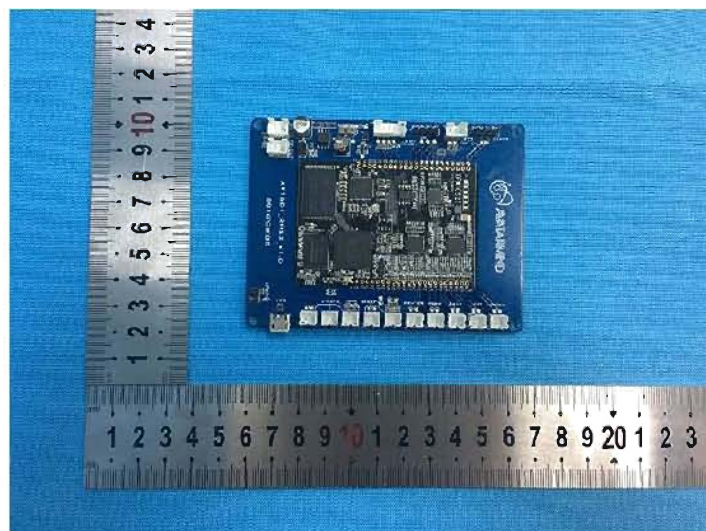
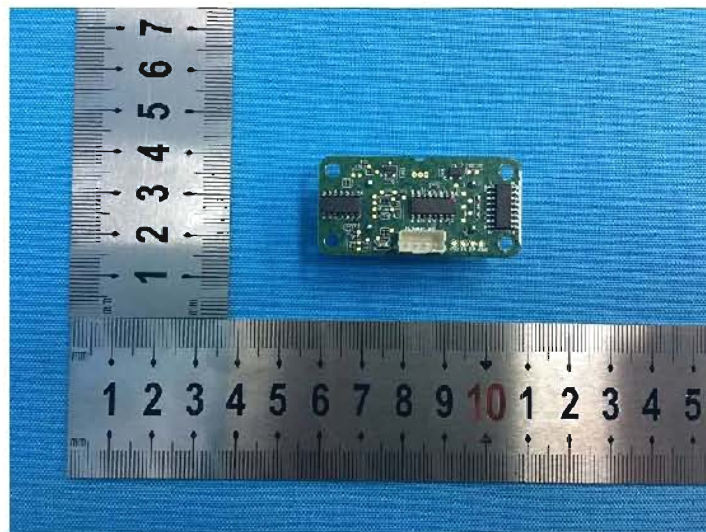


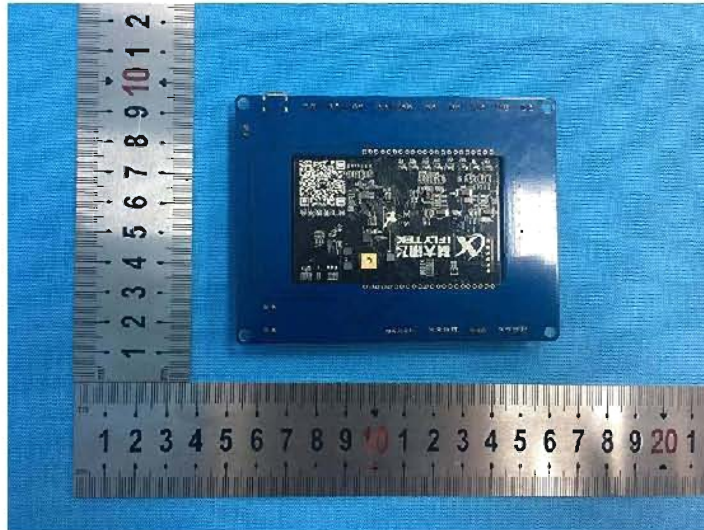




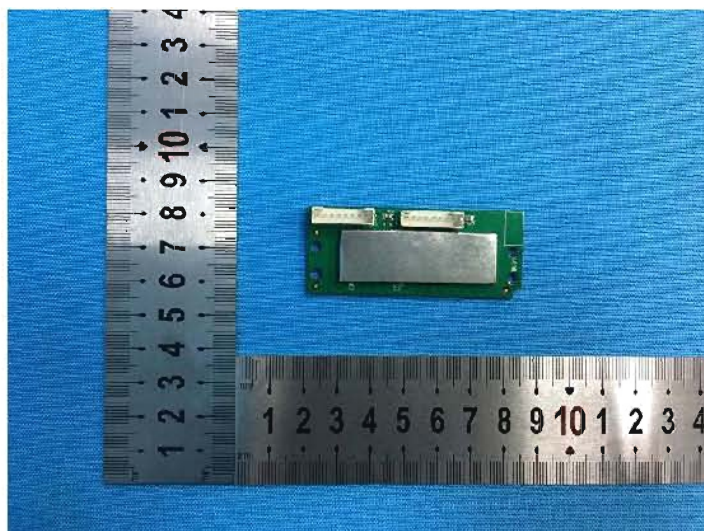
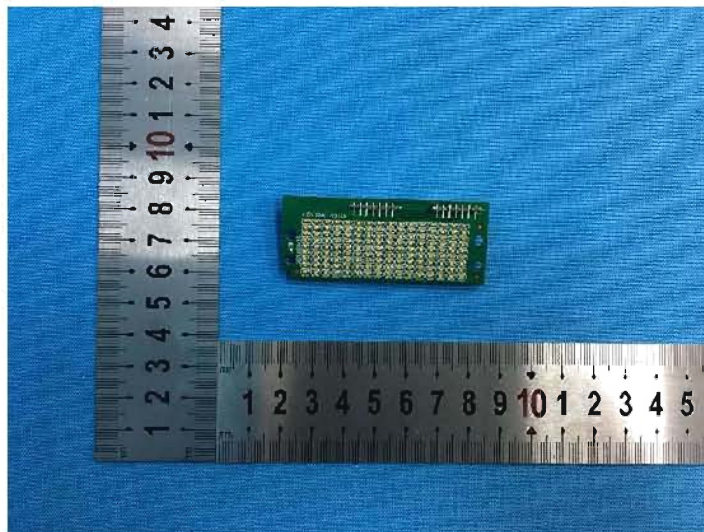


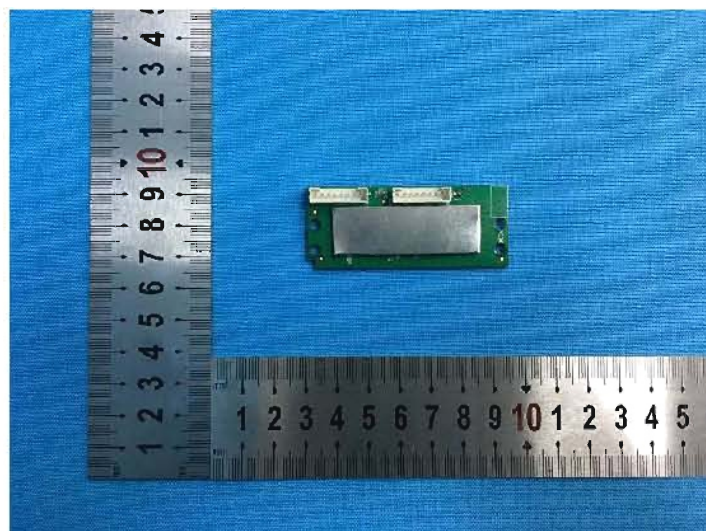
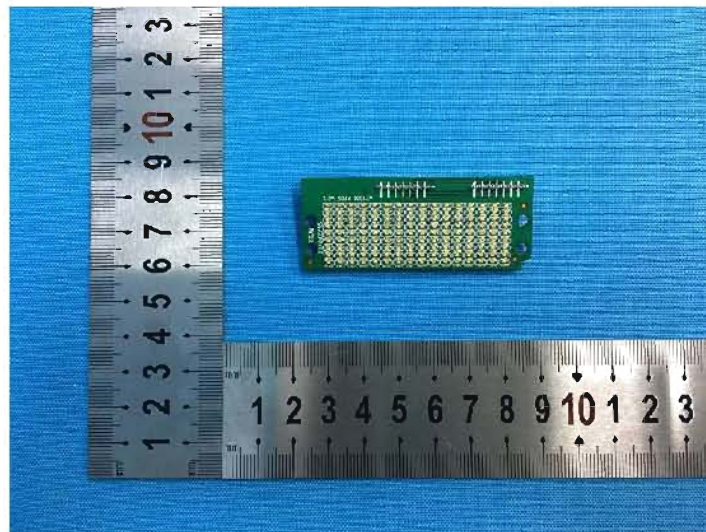
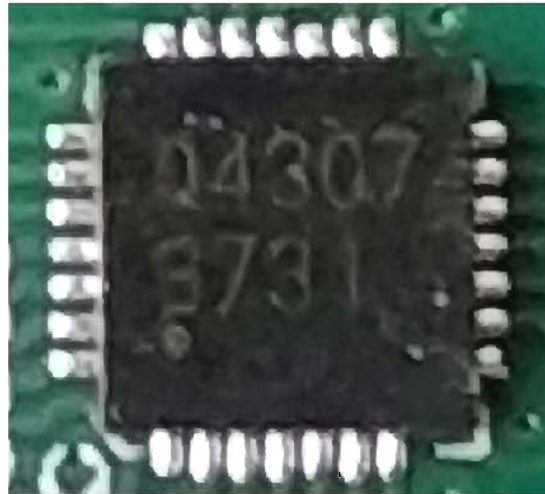


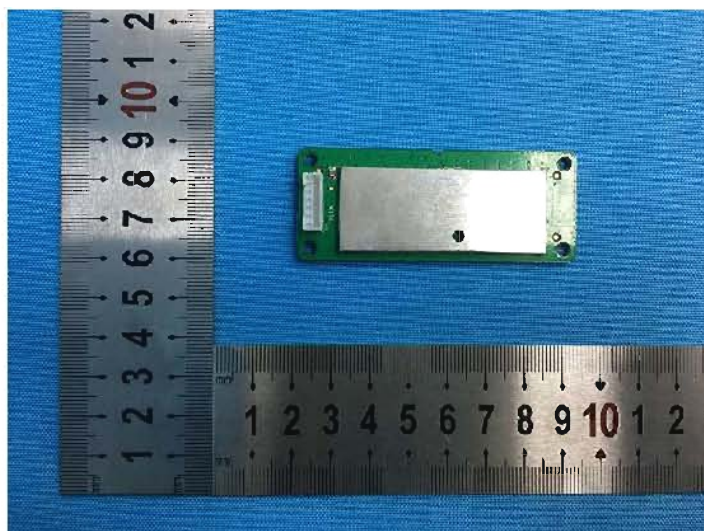
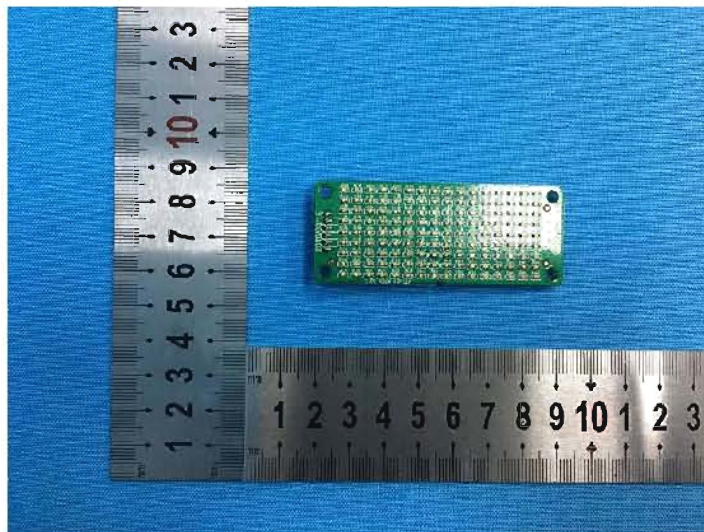


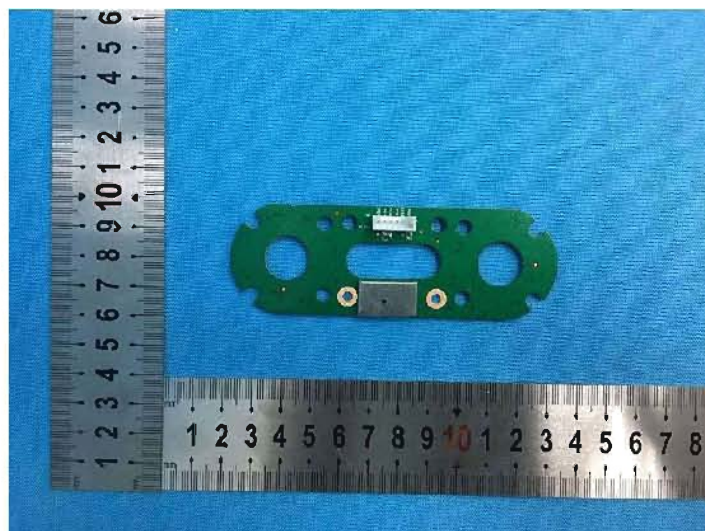


7

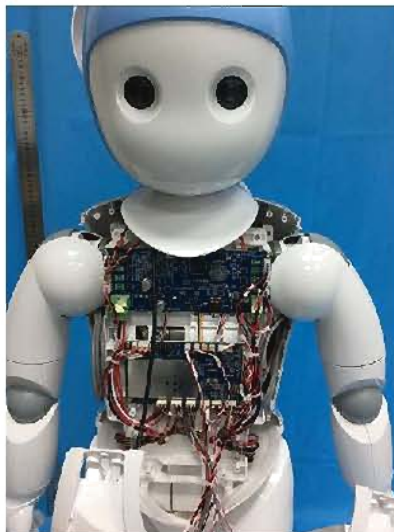












End of Report