



TEST REPORT

FCC PART 15 SUBPART C 15.247

Test report
On Behalf of
certgate GmbH
For
AirID 2 Mini
Model No.: A2MX

FCC ID: 2AOSIA2MX

Prepared for : certgate GmbH
Merianstrasse 26 Nuremberg 90409 Germany

Prepared By : Shenzhen HUAKE Testing Technology Co., Ltd.
1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Fuhai Street,
Bao'an District, Shenzhen City, China

Date of Test: June 22, 2019 ~ June 26, 2019

Date of Report: June 26, 2019

Report Number: HK1906261463E



TEST RESULT CERTIFICATION

Applicant's name: certgate GmbH

Address: Merianstrasse 26 Nuremberg 90409 Germany

Manufacture's Name: certgate GmbH

Address: Merianstrasse 26 Nuremberg 90409 Germany

Product description

Trade Mark:

Product name.....: AirID 2 Mini

Model and/or type reference ...: A2MX

Standards.....: **47 CFR FCC Part 15 Subpart C 15.247**

This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen HUAKE Testing Technology Co., Ltd. is acknowledged as copyright owner and source of the material. Shenzhen HUAKE Testing Technology Co., Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

Date of Test:

Date (s) of performance of tests: June 22, 2019 ~ June 26, 2019

Date of Issue: June 26, 2019

Test Result.....: **Pass**

Prepared by:

Project Engineer

Reviewed by:

Project Supervisor

Approved by:

Technical Director



Contents

	Page
CONTENTS	3
1 TEST SUMMARY	4
1.1 TEST DESCRIPTION.....	4
1.2 MEASUREMENT UNCERTAINTY.....	5
2 TEST FACILITY.....	6
3 GENERAL INFORMATION	6
3.1 GENERAL DESCRIPTION OF EUT	6
3.2 DESCRIPTION OF TEST CONDITIONS.....	8
3.3 DESCRIPTION OF TEST SETUP	8
4 EQUIPMENTS LIST FOR ALL TEST ITEMS	9
5 TEST RESULT	10
5.1 ANTENNA REQUIREMENT.....	10
5.1.1 Standard requirement.....	10
5.2 CONDUCTION EMISSIONS MEASUREMENT	10
5.2.1 Applied procedures / Limit	10
5.2.2 Test procedure.....	10
5.2.3 Test setup	12
5.2.4 Test results	13
5.3 RADIATED EMISSIONS MEASUREMENT	15
5.3.1 Applied procedures / Limit	15
5.3.2 Test setup	15
5.3.3 Test Result.....	17
6 TEST SETUP PHOTO	24
7 PHOTOS OF THE EUT	25



1 Test Summary

1.1 Test Description

Test Item	Test Requirement	Result
Antenna Requirement	§15.203/§15.247 (c)	PASS
Conducted Emission	FCC Part 15.207	PASS
Radiated Emissions	FCC Part 15.205/15.209	PASS
Maximum Peak Output Power	FCC Part 15.247(b)	PASS (See note)
Power Spectral Density	FCC Part 15.247 (e)	PASS (See note)
6dB Bandwidth & 99% Bandwidth	FCC Part 15.247(a)(1)(i)	PASS (See note)
Spurious RF Conducted Emission	FCC Part 15.247(d)	PASS (See note)
Band Edge	FCC Part 15.247(d)	PASS (See note)

Note: Bluetooth module with FCC ID:QOQ13, so all the conducted method test data refer to this FCC ID:QOQ13, not report at this report, only perform the radiation and AC line conducted emission test at this report.



1.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties. The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device. The maximum value of the uncertainty as below:

No.	Item	Uncertainty
1	Conducted Emission Test	1.20dB
2	Radiated Emission Test	3.30dB



2 Test Facility

The test facility is recognized, certified or accredited by the following organizations:

Address of the test laboratory

Shenzhen HUAKE Testing Technology Co., Ltd.

Add.:1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community,
Fuhai Street, Bao'an District, Shenzhen, China

Designation Number: CN1229

Test Firm Registration Number: 616276

3 General Information

3.1 General Description of EUT

EUT Name:	AirID 2 Mini
Model No:	A2MX
Brand Name:	
Operation frequency:	2402 MHz to 2480 MHz
Channel separation:	2MHz
NUMBER OF CHANNEL:	40
Modulation Technology:	GFSK
Hardware Version:	V1.0
Software Version:	V1.1
Antenna Type:	Chip Antenna
Antenna Gain:	1dBi
Power Supply:	DC 5V from USB for Charging DC3.7V By Internal Battery
Note:	
1.For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.	



Description of Channel:					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	14	2430	28	2458
1	2404	15	2432	29	2460
2	2406	16	2434	30	2462
3	2408	17	2436	31	2464
4	2410	18	2438	32	2466
5	2412	19	2440	33	2468
6	2414	20	2442	34	2470
7	2416	21	2444	35	2472
8	2418	22	2446	36	2474
9	2420	23	2448	37	2476
10	2422	24	2450	38	2478
11	2424	25	2452	39	2480
12	2426	26	2454		
13	2428	27	2456		



3.2 Description of Test conditions

(1) E.U.T. test conditions:

For intentional radiators, measurements of the variation of the input power or the adiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

(2) Frequency range of radiated measurements:

The test range will be up to the tenth harmonic of the highest fundamental frequency.

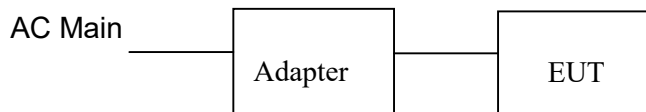
(3) Pre-test the EUT in all transmitting mode at the lowest (2402 MHz), middle (2440 MHz) and highest (2480 MHz) channel with different data packet and conducted to determine the worst-case mode,

only the worst-case results are recorded in this report.

(4) The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

3.3 DESCRIPTION OF TEST SETUP

Operation of EUT during conducted testing



Operation of EUT for Radiation testing:



Adapter information:

Model: TP0505ATD

Input: AC 120V, 2A, 60Hz

Output: 5VDC, 0.5A



4 Equipments List for All Test Items

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	R&S	ENV216	HKE-002	Dec. 28, 2018	1 Year
2.	Receiver	R&S	ESCI 7	HKE-010	Dec. 28, 2018	1 Year
3.	RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 28, 2018	1 Year
4.	Spectrum analyzer	R&S	FSP40	HKE-025	Dec. 28, 2018	1 Year
5.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 28, 2018	1 Year
6.	Preamplifier	Schwarzbeck	BBV 9743	HKE-006	Dec. 28, 2018	1 Year
7.	EMI Test Receiver	Rohde & Schwarz	ESCI 7	HKE-010	Dec. 28, 2018	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	HKE-012	Dec. 28, 2018	1 Year
9.	Loop Antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Dec. 28, 2018	1 Year
10.	Horn Antenna	Schwarzbeck	9120D	HKE-013	Dec. 28, 2018	1 Year
11.	Pre-amplifier	EMCI	EMC051845 SE	HKE-015	Dec. 28, 2018	1 Year
12.	Pre-amplifier	Agilent	83051A	HKE-016	Dec. 28, 2018	1 Year
13.	EMI Test Software EZ-EMC	Tonscend	JS1120-B Version	HKE-083	Dec. 28, 2018	N/A
14.	Power Sensor	Agilent	E9300A	HKE-086	Dec. 28, 2018	1 Year
15.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 28, 2018	1 Year
16.	Signal generator	Agilent	N5182A	HKE-029	Dec. 28, 2018	1 Year
17.	Signal Generator	Agilent	83630A	HKE-028	Dec. 28, 2018	1 Year
18.	Shielded room	Shiel Hong	4*3*3	HKE-039	Dec. 28, 2018	3 Year
19	Hf antenna	Schwarzbeck	LB-180400-K F	HKE-031	Dec. 28, 2018	1 Year



5 Test Result

5.1 Antenna Requirement

5.1.1 Standard requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 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. And according to FCC 47 CFR Section 15.247, if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Refer to statement below for compliance.

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

The antenna used in this product is a chip Antenna, the directional gains of antenna used for transmitting is 1dBi.

5.2 Conduction Emissions Measurement

5.2.1 Applied procedures / Limit

According to FCC CFR Title 47 Part 15 Subpart C Section 15.207, AC Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus as below:

Frequency range (MHz)	Limit (dBuV)	
	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.

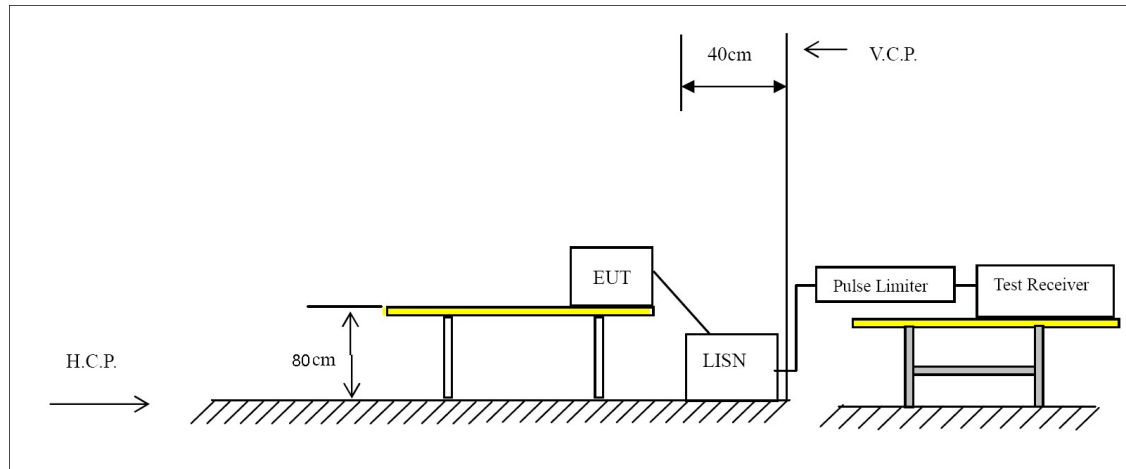
5.2.2 Test procedure

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2013.
2. Support equipment, if needed, was placed as per ANSI C63.10:2013
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2013.
4. The adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.



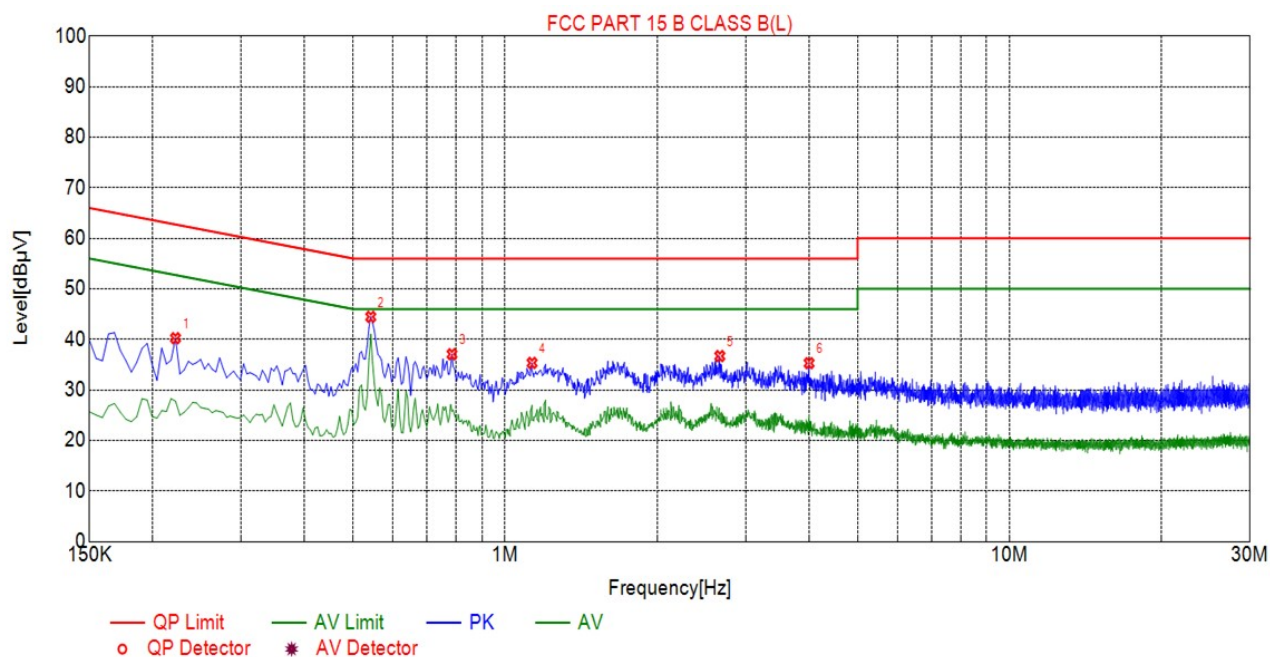
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

5.2.3 Test setup



5.2.4 Test results

Test Specification: Line



Suspected List

NO.	Freq. [MHz]	Level [dBμV]	Factor [dB]	Limit [dBμV]	Margin [dB]	Detector
1	0.2220	40.24	10.04	62.74	22.50	PK
2	0.5415	44.47	10.05	56.00	11.53	PK
3	0.7845	37.08	10.05	56.00	18.92	PK
4	1.1310	35.35	10.08	56.00	20.65	PK
5	2.6655	36.70	10.21	56.00	19.30	PK
6	4.0065	35.30	10.25	56.00	20.70	PK

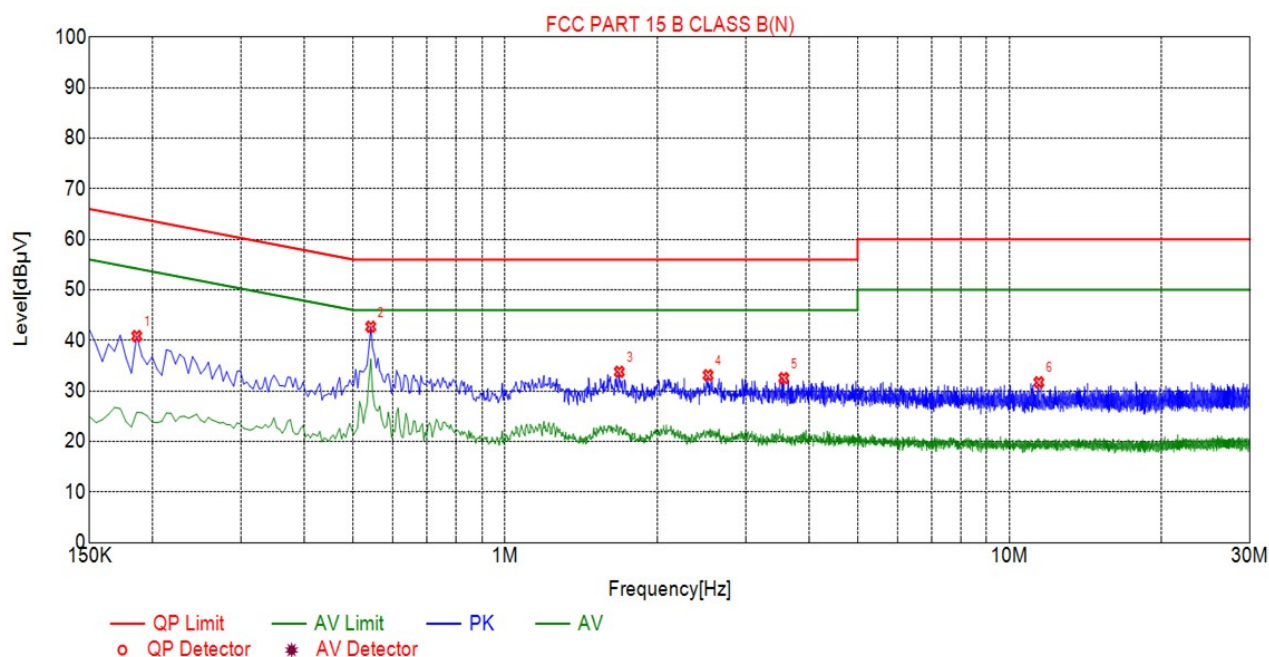
Remark: Margin = Limit – Level

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss (Factor = LISN Factor + Cable Loss)
4. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.



Test Specification: Neutral



Suspected List

NO.	Freq. [MHz]	Level [dBμV]	Factor [dB]	Limit [dBμV]	Margin [dB]	Detector
1	0.1860	40.86	10.05	64.21	23.35	PK
2	0.5415	42.71	10.05	56.00	13.29	PK
3	1.6845	33.80	10.13	56.00	22.20	PK
4	2.5260	33.12	10.19	56.00	22.88	PK
5	3.5700	32.54	10.25	56.00	23.46	PK
6	11.4405	31.71	10.00	60.00	28.29	PK

Remark: Margin = Limit – Level

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
 2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
 3. Final Level = Receiver Read level + LISN Factor + Cable Loss (Factor = LISN Factor + Cable Loss).
- If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

5.3 Radiated Emissions Measurement

5.3.1 Applied procedures / Limit

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission out of authorized band shall not exceed the following table at a 3 meters measurement distance.

In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in table below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

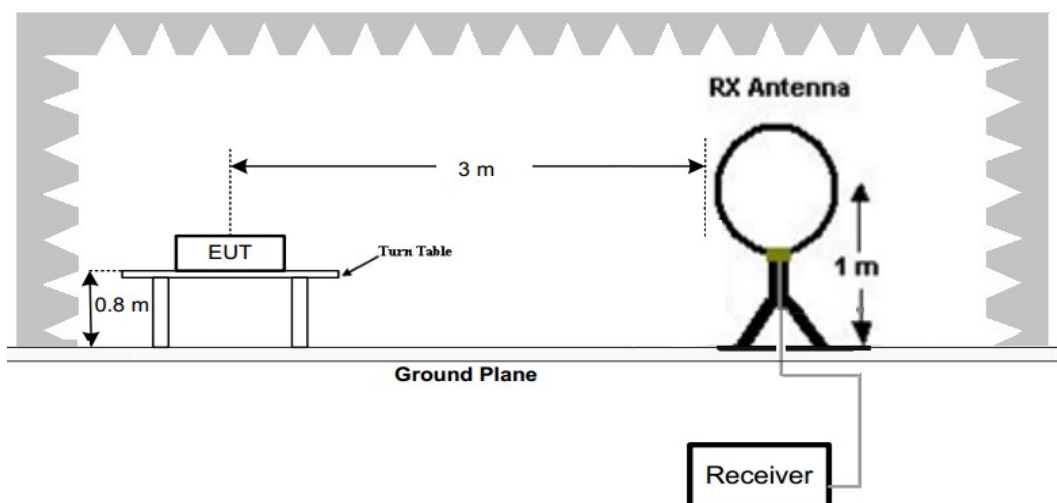
Radiated emission limits

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	$20\log(2400/F(\text{KHz}))+40\log(300/3)$	$2400/F(\text{KHz})$
0.49-1.705	3	$20\log(24000/F(\text{KHz}))+40\log(30/3)$	$24000/F(\text{KHz})$
1.705-30	3	$20\log(30)+40\log(30/3)$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

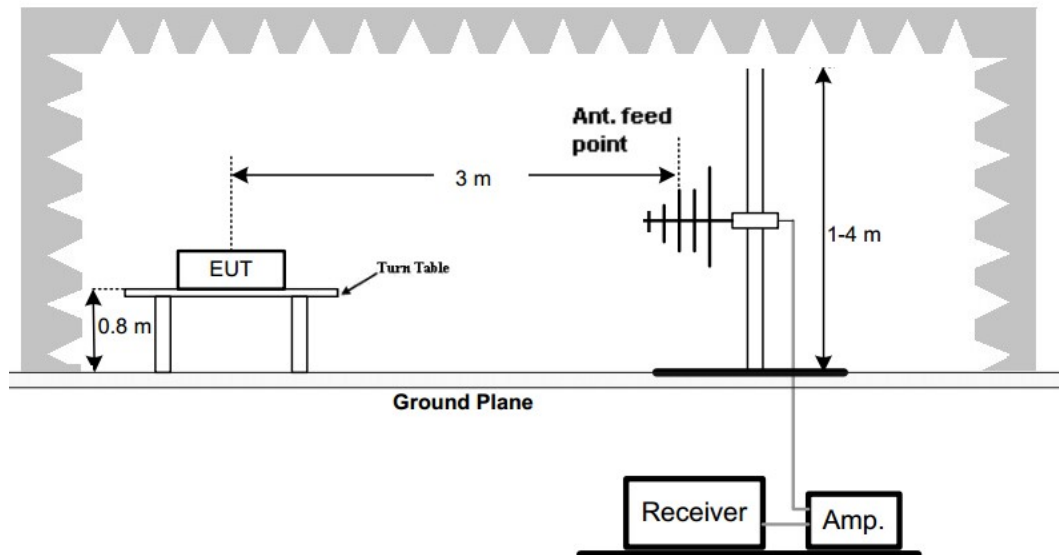
5.3.2 Test setup

Test Configuration:

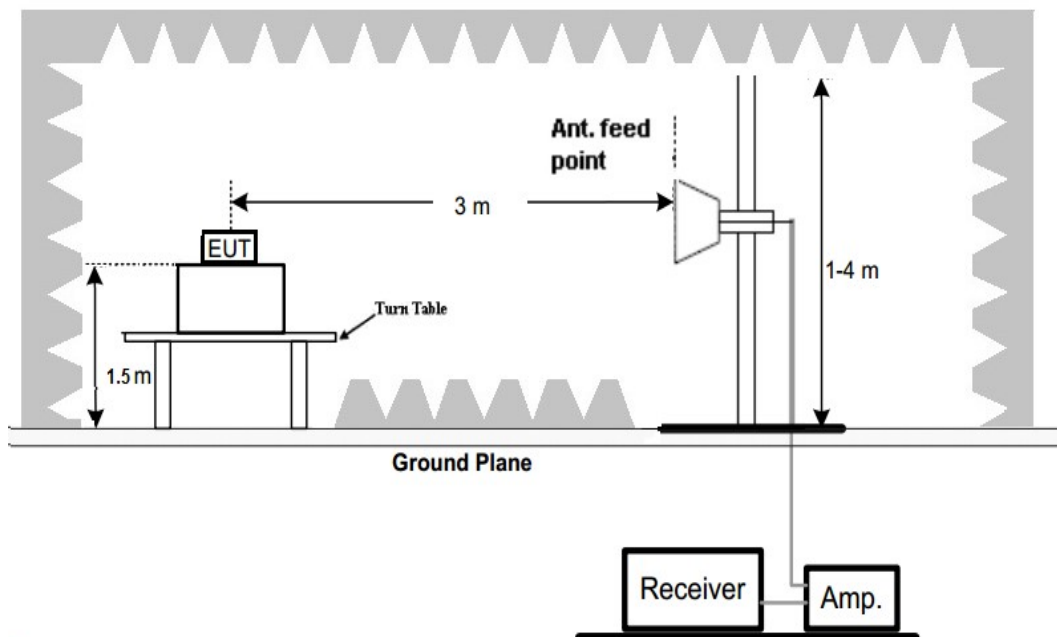
- 1) 9 kHz to 30 MHz emissions:



2) 30 MHz to 1 GHz emissions:



3) 1 GHz to 25 GHz emissions:



Test Procedure

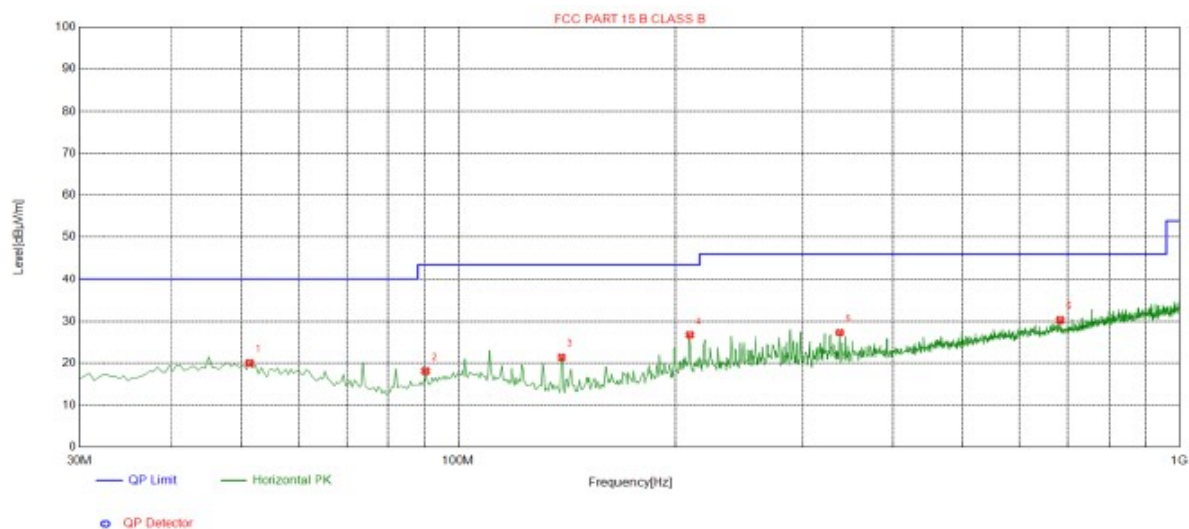
1. The EUT was placed on turn table which is 0.8m above ground plane for below 1GHz test, and on a low permittivity and low loss tangent turn table which is 1.5m above ground plane for above 1GHz test.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0°C to 360°C to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.



5.3.3 Test Result

Below 1GHz Test Results:

Antenna polarity: H

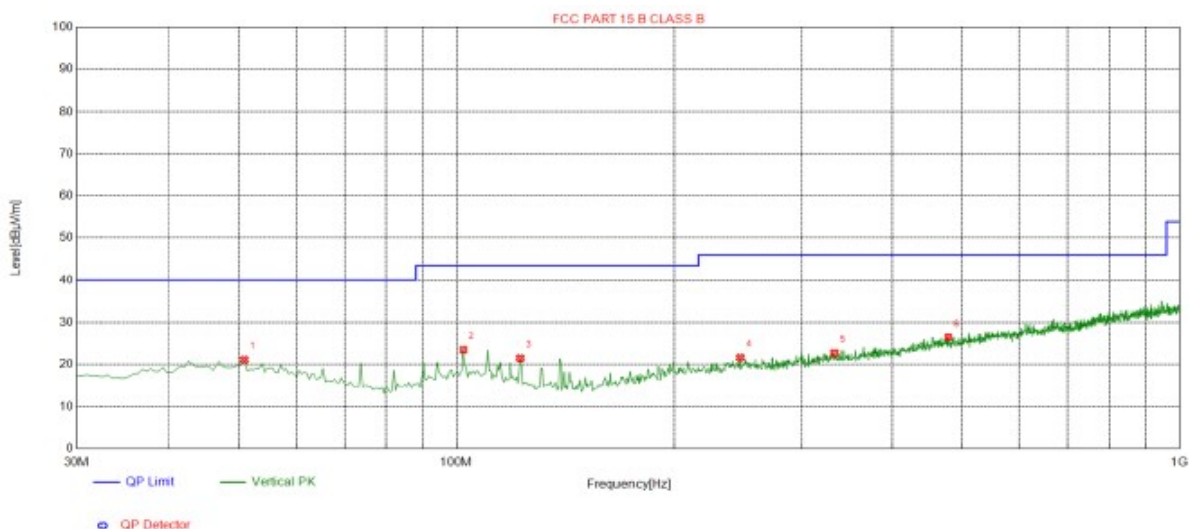


Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	51.3400	20.04	-13.85	40.00	19.96	100	351	Horizontal
2	90.1400	18.20	-17.05	43.50	25.30	100	12	Horizontal
3	139.125	21.38	-19.13	43.50	22.12	100	254	Horizontal
4	209.450	26.75	-14.81	43.50	16.75	100	356	Horizontal
5	337.975	27.32	-11.63	46.00	18.68	100	341	Horizontal
6	684.265	30.33	-5.02	46.00	15.67	100	52	Horizontal

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Limit – Level



Antenna polarity: V



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	50.8550	21.10	-13.78	40.00	18.90	100	154	Vertical
2	102.265	23.47	-15.41	43.50	20.03	100	131	Vertical
3	122.635	21.49	-17.49	43.50	22.01	100	267	Vertical
4	246.795	21.62	-13.54	46.00	24.38	100	157	Vertical
5	333.125	22.68	-11.61	46.00	23.32	100	220	Vertical
6	479.110	26.42	-8.44	46.00	19.58	100	164	Vertical

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Limit – Level

Remark :

(1) Measuring frequencies from 9 KHz to the 1 GHz, Radiated emission test from 9KHz to 30MHz was verified, and no any emission was found except system noise floor.

(2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.

(3) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

For 1GHz to 25GHz

CH Low (2402MHz)

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804	57.87	-3.65	54.22	74.00	-19.78	peak
4804	46.85	-3.65	43.20	54.00	-10.80	AVG
7206	57.37	-0.95	56.42	74.00	-17.58	peak
7206	42.87	-0.95	41.92	54.00	-12.08	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804	53.84	-3.65	50.19	74.00	-23.81	peak
4804	45.84	-3.65	42.19	54.00	-11.81	AVG
7206	55.84	-0.95	54.89	74.00	-19.11	peak
7206	45.73	-0.95	44.78	54.00	-9.22	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						



CH High (2480MHz)

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
4960	54.74	-3.43	51.31	74.00	-22.69	peak
4960	43.00	-3.44	39.56	54.00	-14.44	AVG
7440	57.40	-0.77	56.63	74.00	-17.37	peak
7440	43.98	-0.77	43.21	54.00	-10.79	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
4960	57.84	-3.43	54.41	74.00	-19.59	peak
4960	46.74	-3.44	43.30	54.00	-10.70	AVG
7440	55.84	-0.77	55.07	74.00	-18.93	peak
7440	46.83	-0.77	46.06	54.00	-7.94	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Remark:

(1) Measuring frequencies from 1 GHz to the 25 GHz.

(2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.

(3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.

(4) Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak

detection at frequency above 1GHz.

(6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

(7) All modes of operation were investigated and the worst-case emissions are reported.

Radiated Band Edge Test:

Operation Mode: TX CH Low (2402MHz)

Horizontal (Worst case):

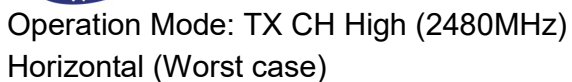
Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310.00	50.77	-5.81	44.96	74	-29.04	peak
2310.00	/	-5.81	/	54	/	AVG
2390.00	58.84	-5.84	53	74	-21	peak
2390.00	42.84	-5.84	37.00	54	-17.00	AVG
2400.00	65.53	-5.84	59.69	74	-14.31	peak
2400.00	49.75	-5.84	43.91	54	-10.09	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310.00	53.75	-5.81	47.94	74	-26.06	peak
2310.00	/	-5.81	/	54	/	AVG
2390.00	54.98	-5.84	49.14	74	-24.86	peak
2390.00	48.74	-5.84	42.90	54	-11.10	AVG
2400.00	62.47	-5.84	56.63	74	-17.37	peak
2400.00	54.87	-5.84	49.03	54	-4.97	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

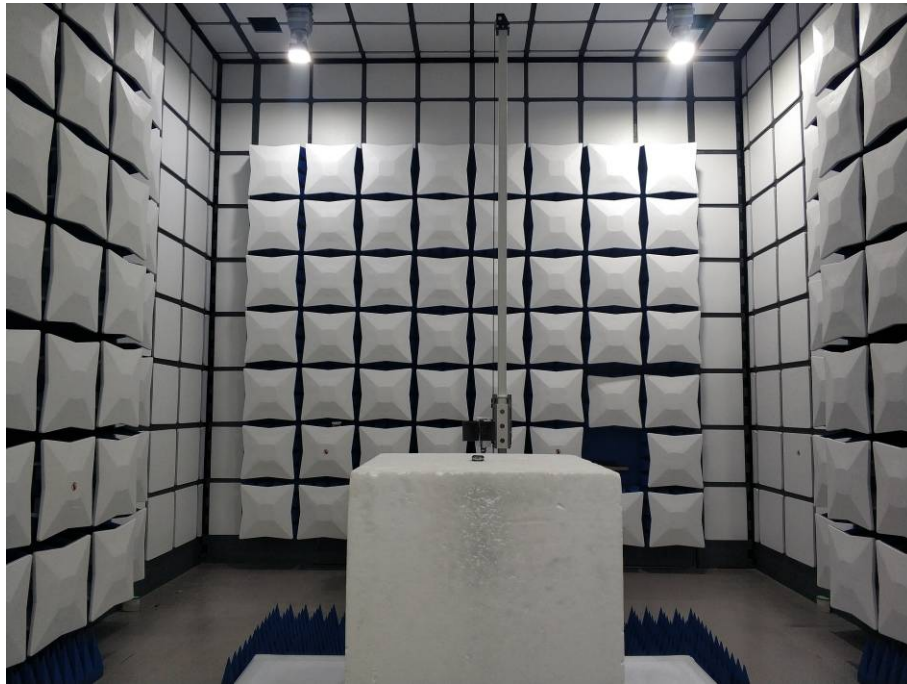


Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.50	56.84	-5.81	51.03	74	-22.97	peak
2483.50	/	-5.81	/	54	/	AVG
2500.00	53.73	-6.06	47.67	74	-26.33	peak
2500.00	/	-6.06	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

6 Test setup photo





7 PHOTOS OF THE EUT

A2MX

External Photo

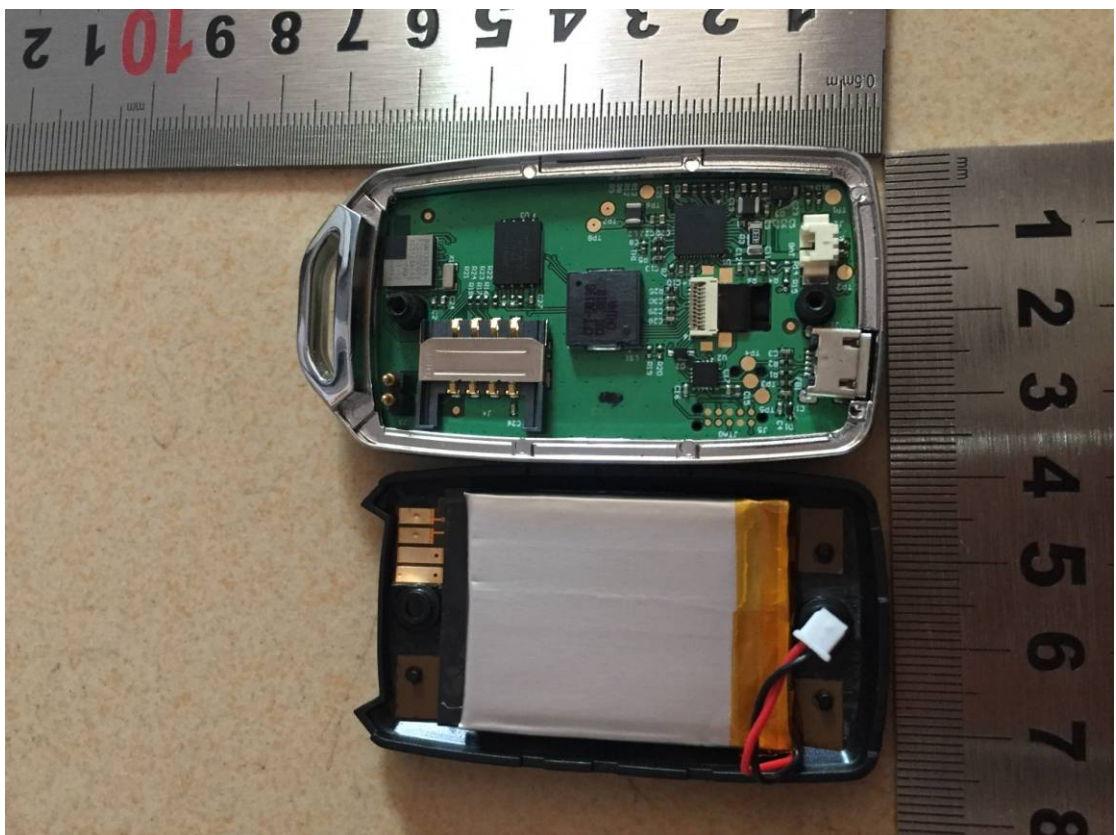


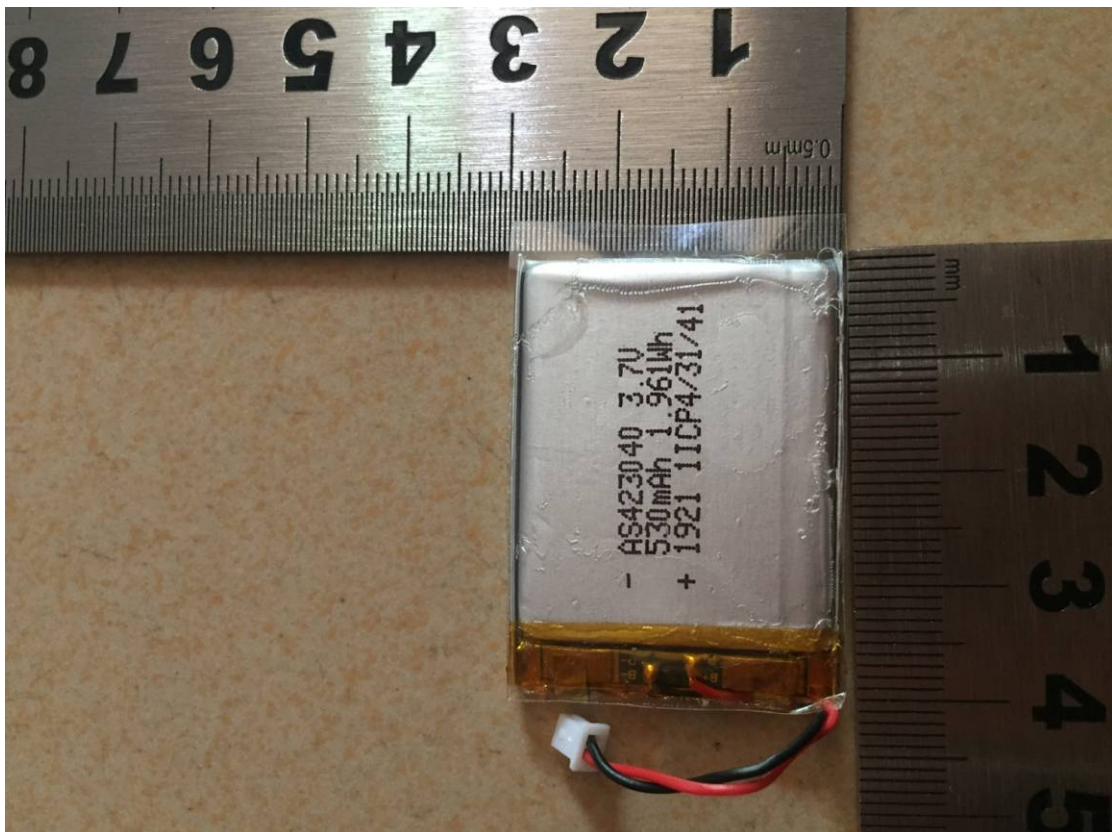
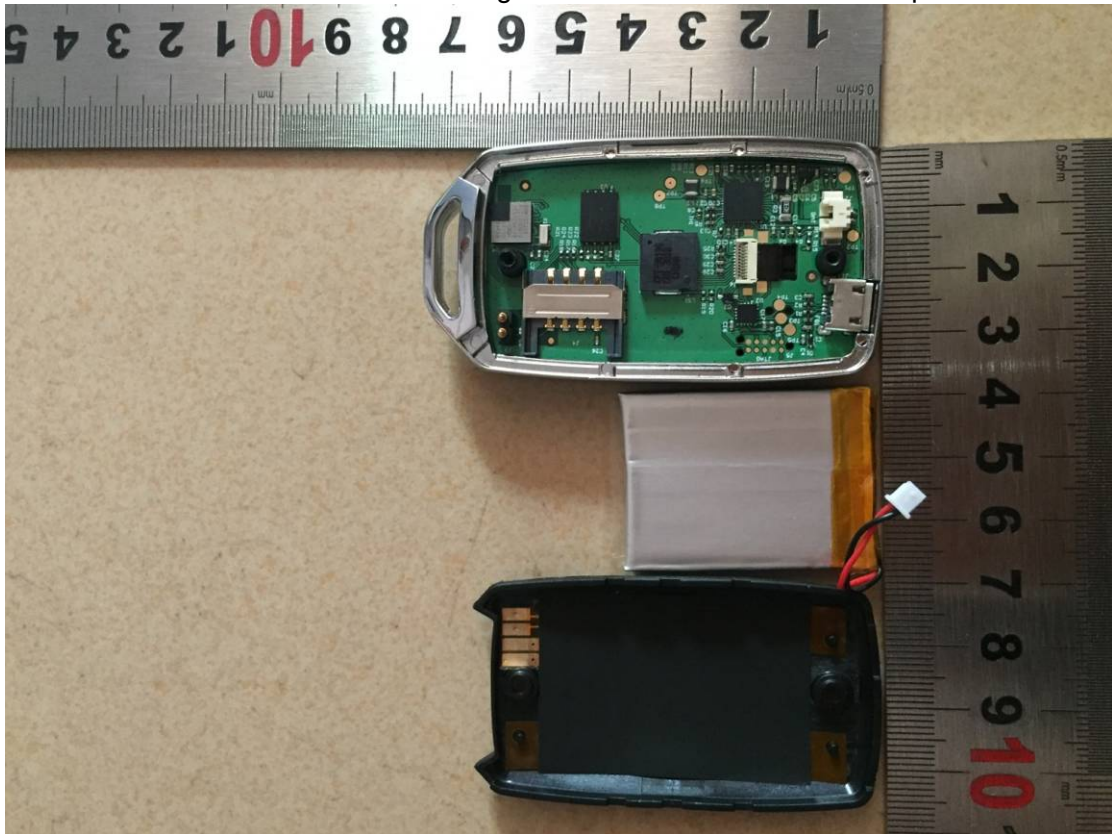


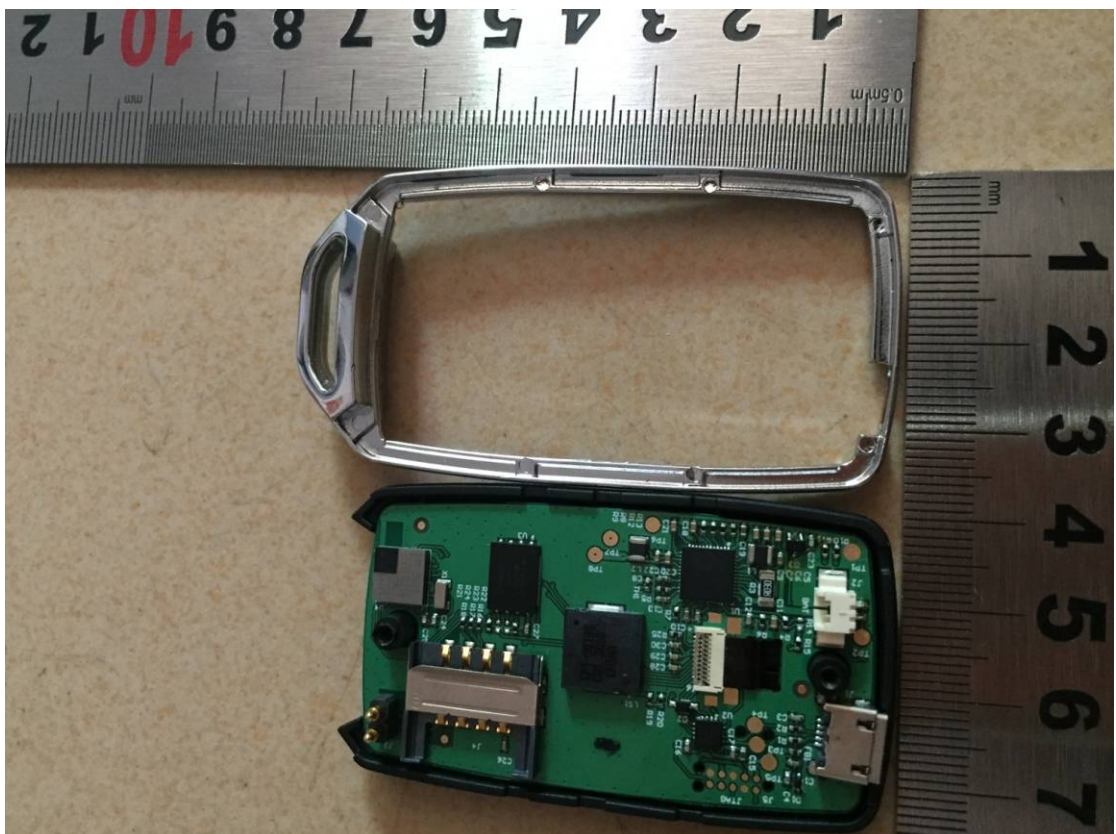
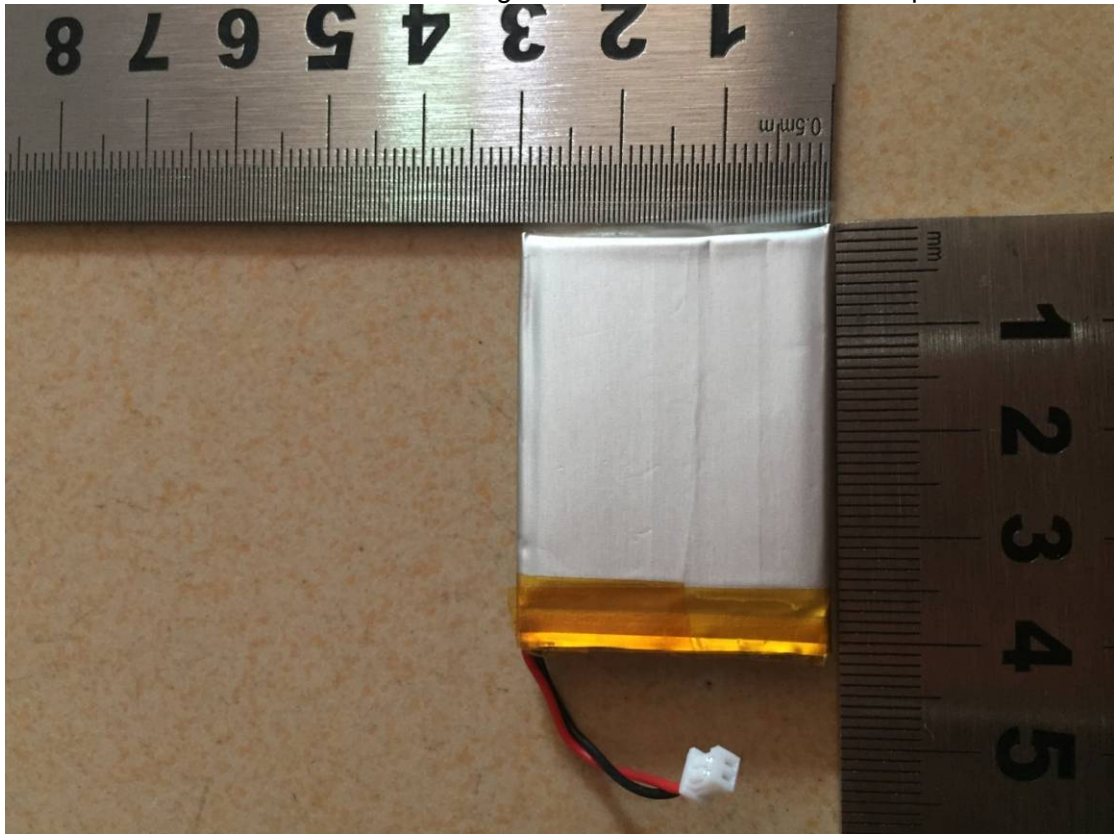


**A2MX**

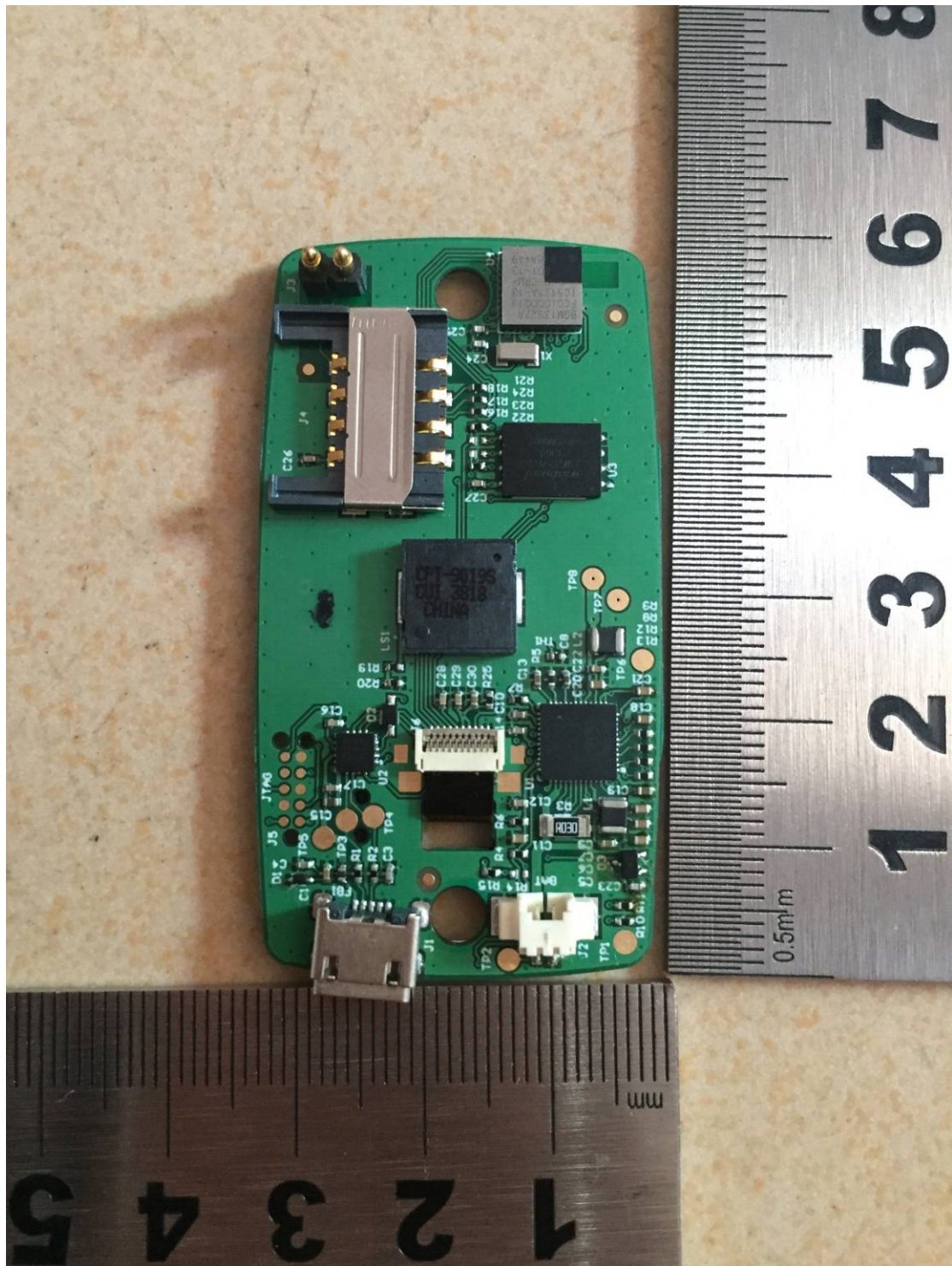
Internal Photo

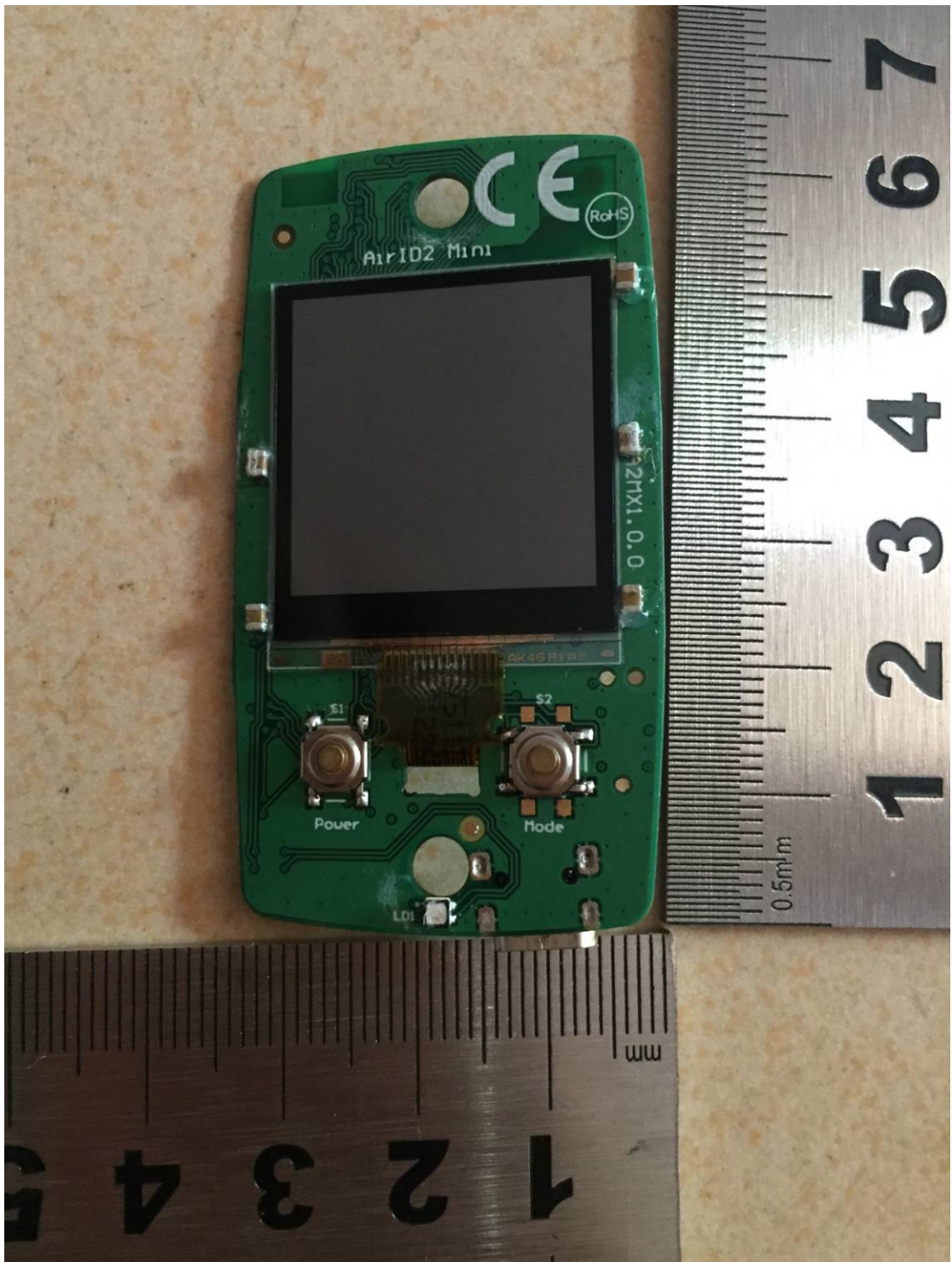


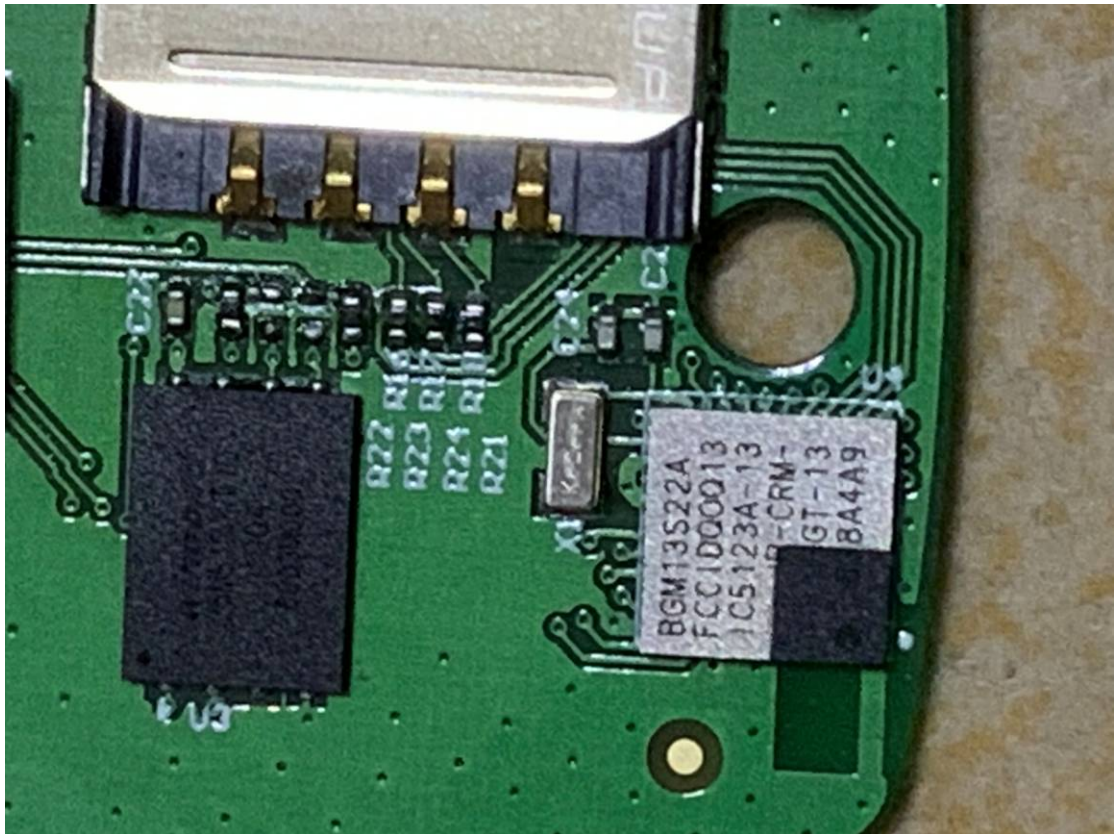












-----End of test report-----