

Test Report

Report No. : CQASZ20211202192E-01

Applicant: Qolsys, Inc.

Address of Applicant: 1919 S. Bascom Ave. Suite 600 Campbell, CA 95008

Equipment Under Test (EUT):

Product: Portable electronic tablet computer

All Model No.: IQ Hub

Test Model No.: IQ Hub

Brand Name: Qolsys, Inc.

FCC ID: 2AAJXQS-IQHUB

Standards: FCC Part 15 Subpart E 15.407
FCC Part 15 Subpart C 15.247
FCC Part 15 Subpart C 15.249
FCC Part 15 Subpart C 15.231

Date of Receipt: 2021-12-17

Date of Test: 2021-12-17 to 2021-12-27

Date of Issue: 2022-04-13

Test Result : **PASS***

Tested By:

Timo Lei

(Timo Lei)

Reviewed By:

Rock Huang

(Rock Huang)

Approved By:

Jack Ai

(Jack Ai)



* In the configuration tested, the EUT complied with the standards specified above.

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CQA, this report can't be reproduced except in full.

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20211202192E-01	Rev.01	Initial report	2022-04-13

Notes:

This product has not changed in the wireless part of the original case, and the product layout has been changed.

2 Test Summary

Test Item	Test Requirement	Test method	Result
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10 (2013)	PASS
Radiated Spurious emissions	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 (2013)	PASS

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4 General Information

4.1 Client Information

Applicant:	Qolsys, Inc.
Address of Applicant:	1919 S. Bascom Ave. Suite 600 Campbell, CA 95008
Manufacturer:	Chengdu Vantron Technology Co., Ltd.
Address of Manufacturer:	No.5 GaoPeng Road, Hi-Tech Zone, Chengdu, SiChuan, P.R. China 610045
Factory:	Chengdu Vantron Technology Co., Ltd.
Address of Factory:	No.5 GaoPeng Road, Hi-Tech Zone, Chengdu, SiChuan, P.R. China 610045

4.2 General Description of EUT

Product Name:	Portable electronic tablet computer
Model No.:	IQ Hub
Test Model No.:	IQ Hub
Trade Mark:	Qolsys, Inc.
Software Version:	1.0 FCC
Hardware Version:	Rev 5.1.1
Frequency Range:	PowerG:912.75~919.106MHz Z-Wave:908.4MHz ~ 916MHz Bluetooth: 2402MHz~2480MHz WiFi 802.11 b/g/n: 2412MHz to 2462MHz IEEE802.11ac: 5150MHz ~5250 MHz IEEE802.11ac(80M): 5725MHz ~5850MHz LTE:Band 2/4/5/12/13/25/26
Modulation Type:	PowerG: GFSK Z-Wave:GFSK Bluetooth: GFSK, $\pi/4$ DQPSK, 8DPSK WiFi 802.11 b/g/n: DSSS, OFDM IEEE802.11ac: OFDM IEEE802.11ac(80M): OFDM LTE: QPSK, 16QAM, 64QAM
Sample Type:	☐ Mobile ☐ Portable ☒ Fix Location
Test mode:	MAX MPE of Wi-Fi(2.4G)&PowerG&Z-wave&MAX MPELTE
Power Supply:	Li-ion battery: DC 3.7V 2600mAh 9.62Wh, Charge by DC 12V for adapter
Adapter:	MODEL:SW-120100 INPUT:100-240V~50/60Hz 0.68A Max OUTPUT:12.0V = 1000mA

Note:

All model:IQ Hub, IQ Hub PowerG

Only test the IQ Hub model, because the circuit design, layout, components and internal wiring of the above models are the same, but the model name is different.

4.3 Test Environment

Operating Environment:	
Temperature:	25.5 °C
Humidity:	53 % RH
Atmospheric Pressure:	1009mbar
Test Mode:	Use test software to set the lowest frequency, the middle frequency and the highest frequency keep transmitting of the EUT.

4.4 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.	Remark	FCC certification
/	/	/	/	/

4.5 Statement of the measurement uncertainty

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 **Shenzhen Huaxia Testing Technology Co., Ltd.** 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.

Hereafter the best measurement capability for CQA laboratory is reported:

No.	Item	Uncertainty	Notes
1	Radiated Emission (Below 1GHz)	±5.12dB	(1)
2	Radiated Emission (Above 1GHz)	±4.60dB	(1)
3	Conducted Disturbance (0.15~30MHz)	±3.34dB	(1)
4	Radio Frequency	3×10^{-8}	(1)
5	Duty cycle	0.6 %.	(1)
6	Occupied Bandwidth	1.1%	(1)
7	RF conducted power	0.86dB	(1)
8	RF power density	0.74	(1)
9	Conducted Spurious emissions	0.86dB	(1)
10	Temperature test	0.8℃	(1)
11	Humidity test	2.0%	(1)
12	Supply voltages	0.5 %.	(1)
13	time	0.6 %.	(1)
14	Frequency Error	5.5 Hz	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.6 Test Location

Shenzhen Huaxia Testing Technology Co., Ltd.

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

4.7 Test Facility

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

IC Registration No.: 22984-1

The 3m Semi-anechoic chamber of Shenzhen Huaxia Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

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

• **CNAS (No. CNAS L5785)**

CNAS has accredited Shenzhen Huaxia Testing Technology Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• **A2LA (Certificate No. 4742.01)**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4742.01.

• **FCC Registration No.: 522263**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.:522263

4.8 Abnormalities from Standard Conditions

None.

4.9 Other Information Requested by the Customer

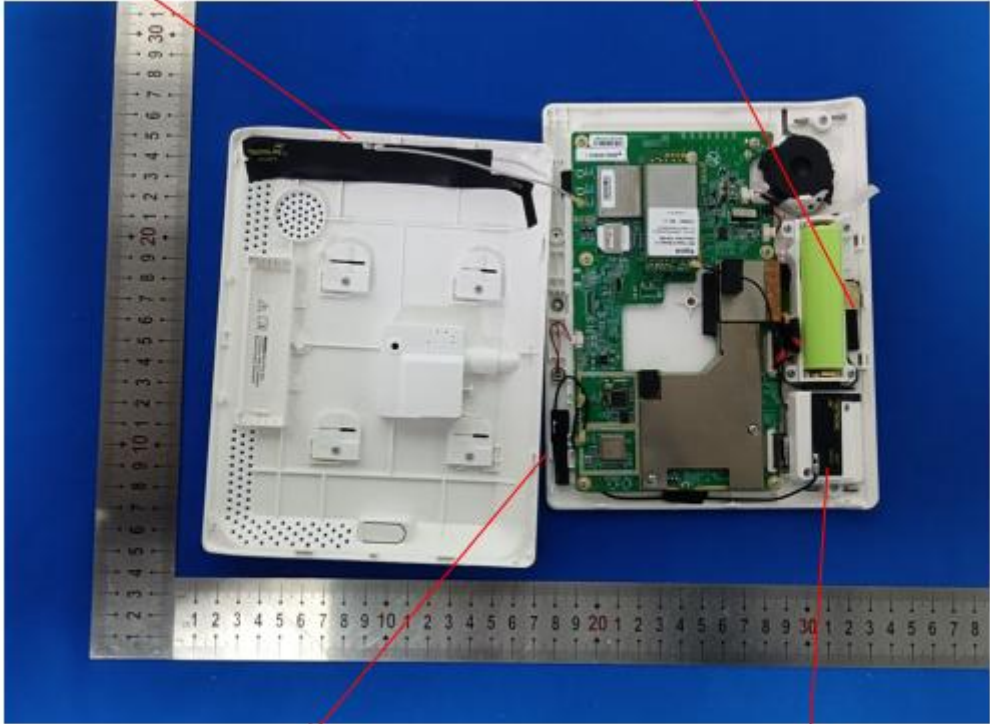
None.

4.10 Equipment List

Test Equipment	Manufacturer	Model No.	Instrument No.	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR7	CQA-005	2021/9/10	2022/9/9
Spectrum analyzer	R&S	FSU26	CQA-038	2021/9/10	2022/9/9
Preamplifier	MITEQ	AFS4-00010300-18-10P-4	CQA-035	2021/9/10	2022/9/9
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2021/9/10	2022/9/9
Loop antenna	Schwarzbeck	FMZB1516	CQA-087	2021/9/16	2024/9/15
Bilog Antenna	R&S	HL562	CQA-011	2021/9/16	2024/9/15
Horn Antenna	R&S	HF906	CQA-012	2021/9/16	2024/9/15
Horn Antenna	Schwarzbeck	BBHA 9170	CQA-088	2021/9/16	2024/9/15
Coaxial Cable (Above 1GHz)	CQA	N/A	C019	2021/9/10	2022/9/9
Coaxial Cable (Below 1GHz)	CQA	N/A	C020	2021/9/10	2022/9/9
Antenna Connector	CQA	RFC-01	CQA-080	2021/9/10	2022/9/9
RF cable(9KHz~40GHz)	CQA	RF-01	CQA-079	2021/9/10	2022/9/9
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2021/9/10	2022/9/9
EMI Test Receiver	R&S	ESPI3	CQA-013	2021/9/10	2022/9/9
LISN	R&S	ENV216	CQA-003	2021/9/10	2022/9/9
Coaxial cable	CQA	N/A	CQA-C009	2021/9/10	2022/9/9

5 Test results and Measurement Data

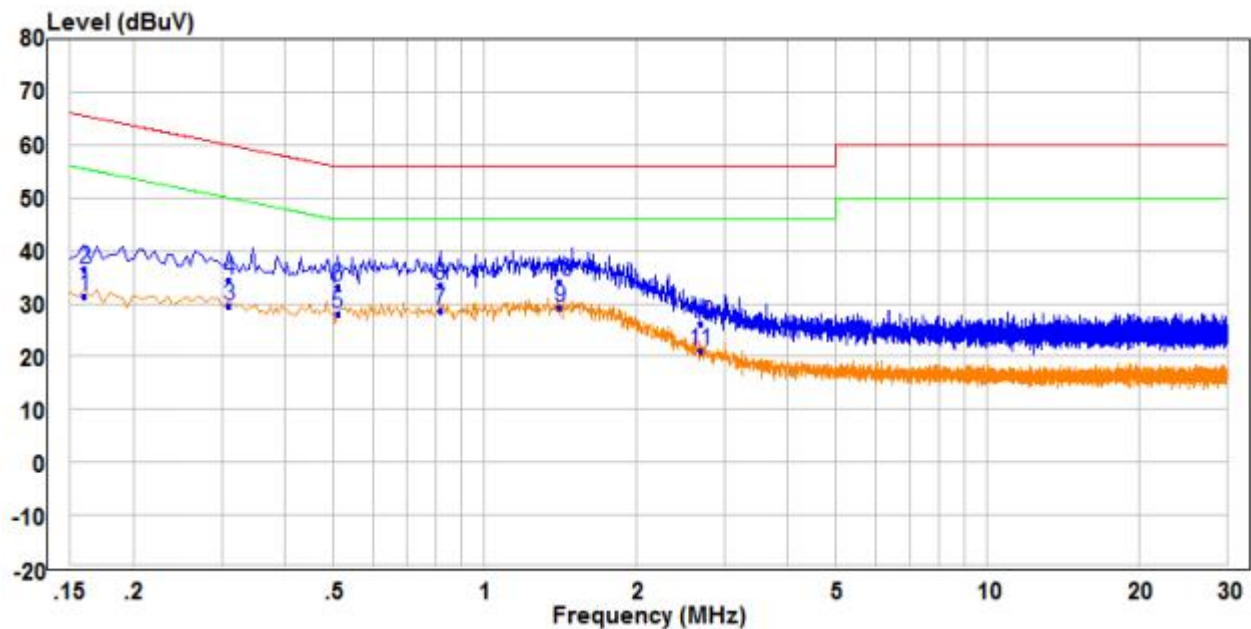
5.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)
15.203 requirement: 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
EUT Antenna:	LTE Ant PowerG Ant  Z-wave Ant BT, 2.4G and 5G wifi

Exploratory Test Mode:	Non-hopping transmitting mode with all kind of modulation and all kind of data type at the lowest, middle, high channel.
Final Test Mode:	MAX MPE of Wi-Fi(2.4G)&Z-wave&PowerG &MAX MPELTE
Test Voltage:	AC 120V/60Hz
Test Results:	Pass

Measurement Data

Live line:

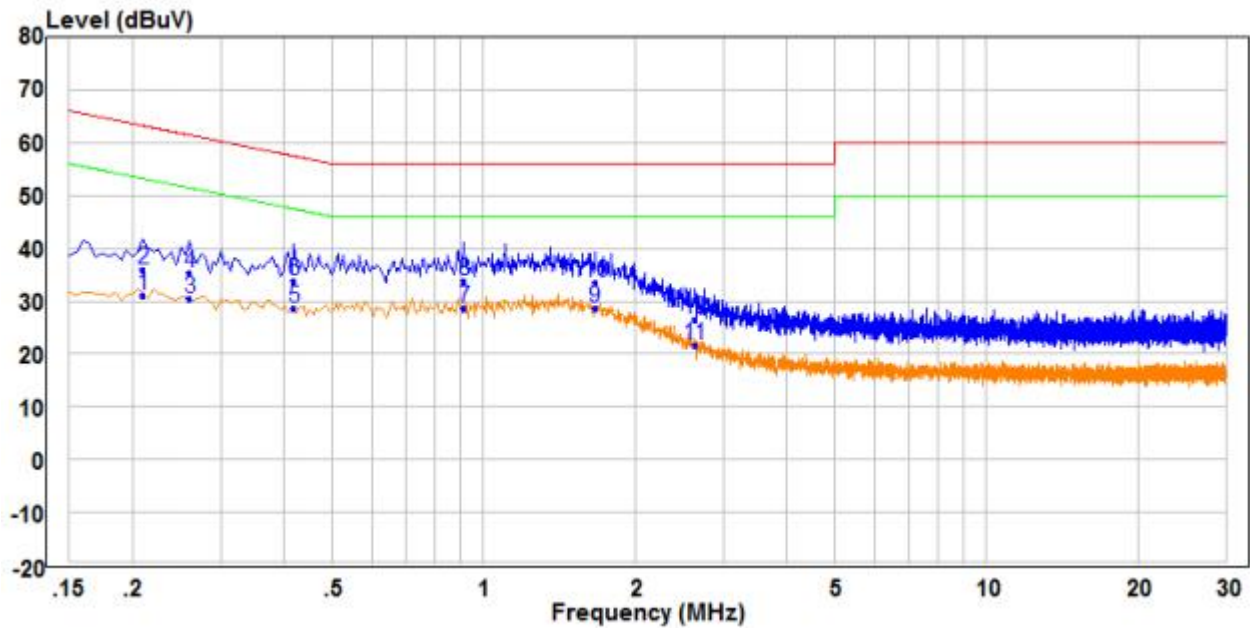


	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB		
1	0.160	21.92	9.49	31.41	55.46	-24.05	Average	Line
2	0.160	27.06	9.49	36.55	65.46	-28.91	QP	Line
3	0.310	20.19	9.49	29.68	49.97	-20.29	Average	Line
4	0.310	24.95	9.49	34.44	59.97	-25.53	QP	Line
5	0.510	18.65	9.54	28.19	46.00	-17.81	Average	Line
6	0.510	23.80	9.54	33.34	56.00	-22.66	QP	Line
7	0.815	19.03	9.73	28.76	46.00	-17.24	Average	Line
8	0.815	23.89	9.73	33.62	56.00	-22.38	QP	Line
9 PP	1.410	19.82	9.53	29.35	46.00	-16.65	Average	Line
10 QP	1.410	24.69	9.53	34.22	56.00	-21.78	QP	Line
11	2.690	11.54	9.58	21.12	46.00	-24.88	Average	Line
12	2.690	16.52	9.58	26.10	56.00	-29.90	QP	Line

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level = Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

Neutral line:



	Freq	Read		Limit	Over		
	MHz	Level	Factor	Line	Limit	Remark	Pol/Phase
		dBuV	dB	dBuV	dBuV	dB	
1	0.210	21.52	9.59	31.11	53.21	-22.10	Average
2	0.210	26.38	9.59	35.97	63.21	-27.24	QP
3	0.260	20.79	9.53	30.32	51.43	-21.11	Average
4	0.260	25.85	9.53	35.38	61.43	-26.05	QP
5	0.420	18.98	9.62	28.60	47.45	-18.85	Average
6	0.420	24.19	9.62	33.81	57.45	-23.64	QP
7 PP	0.915	18.93	9.76	28.69	46.00	-17.31	Average
8 QP	0.915	23.93	9.76	33.69	56.00	-22.31	QP
9	1.665	18.90	9.73	28.63	46.00	-17.37	Average
10	1.665	23.83	9.73	33.56	56.00	-22.44	QP
11	2.630	11.86	9.76	21.62	46.00	-24.38	Average
12	2.630	16.81	9.76	26.57	56.00	-29.43	QP

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level = Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

5.3 Radiated Spurious Emission & Restricted bands

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205				
Test Method:	ANSI C63.10: 2013				
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
	0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
	0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	30MHz-1GHz	Peak	100 kHz	300kHz	Peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
Peak		1MHz	10Hz	Average	
Limit:	Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz-88MHz	100	40.0	Quasi-peak	3
	88MHz-216MHz	150	43.5	Quasi-peak	3
	216MHz-960MHz	200	46.0	Quasi-peak	3
	960MHz-1GHz	500	54.0	Quasi-peak	3
	Above 1GHz	500	54.0	Average	3
	Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.				
In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: An amount equal to 43 dB plus 10 times the logarithm (to the base 10) of the transmitter power in watts.					
Limit (dBm)		Equivalent Field strength Limit at 3M (dBuV/m)			
-13		82.2			

Test Setup:

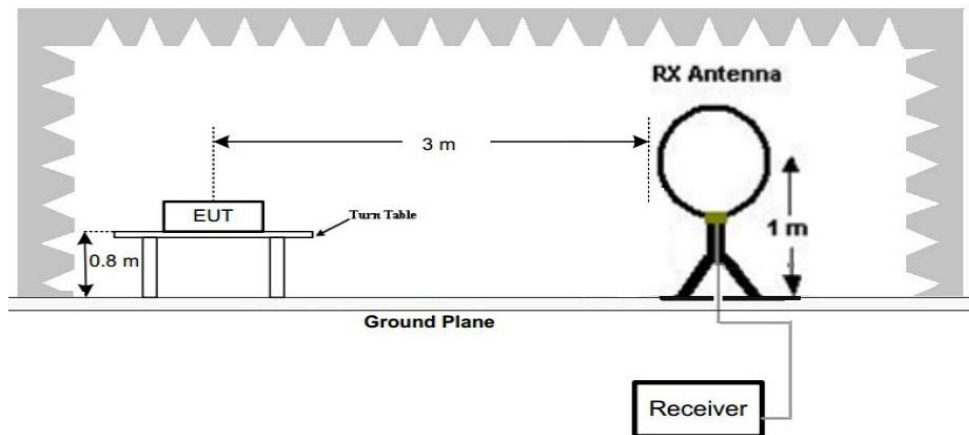


Figure 1. Below 30MHz

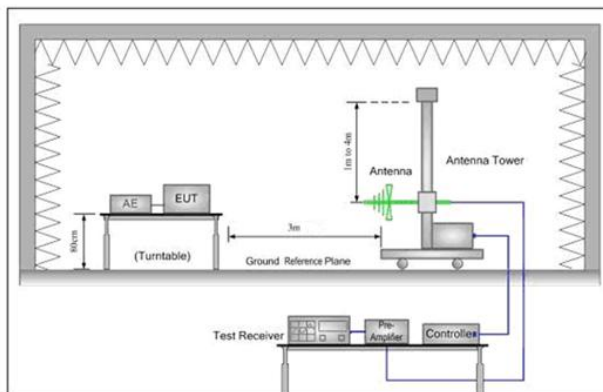


Figure 2. 30MHz to 1GHz

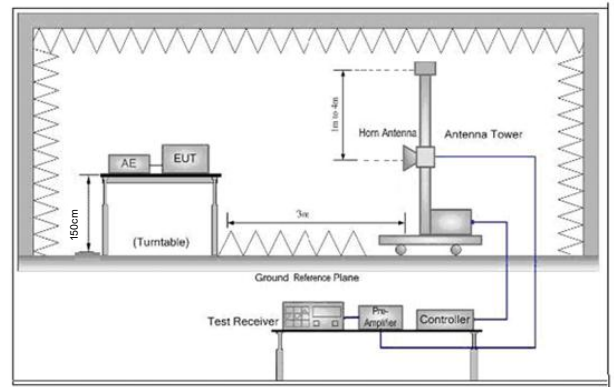


Figure 3. Above 1 GHz

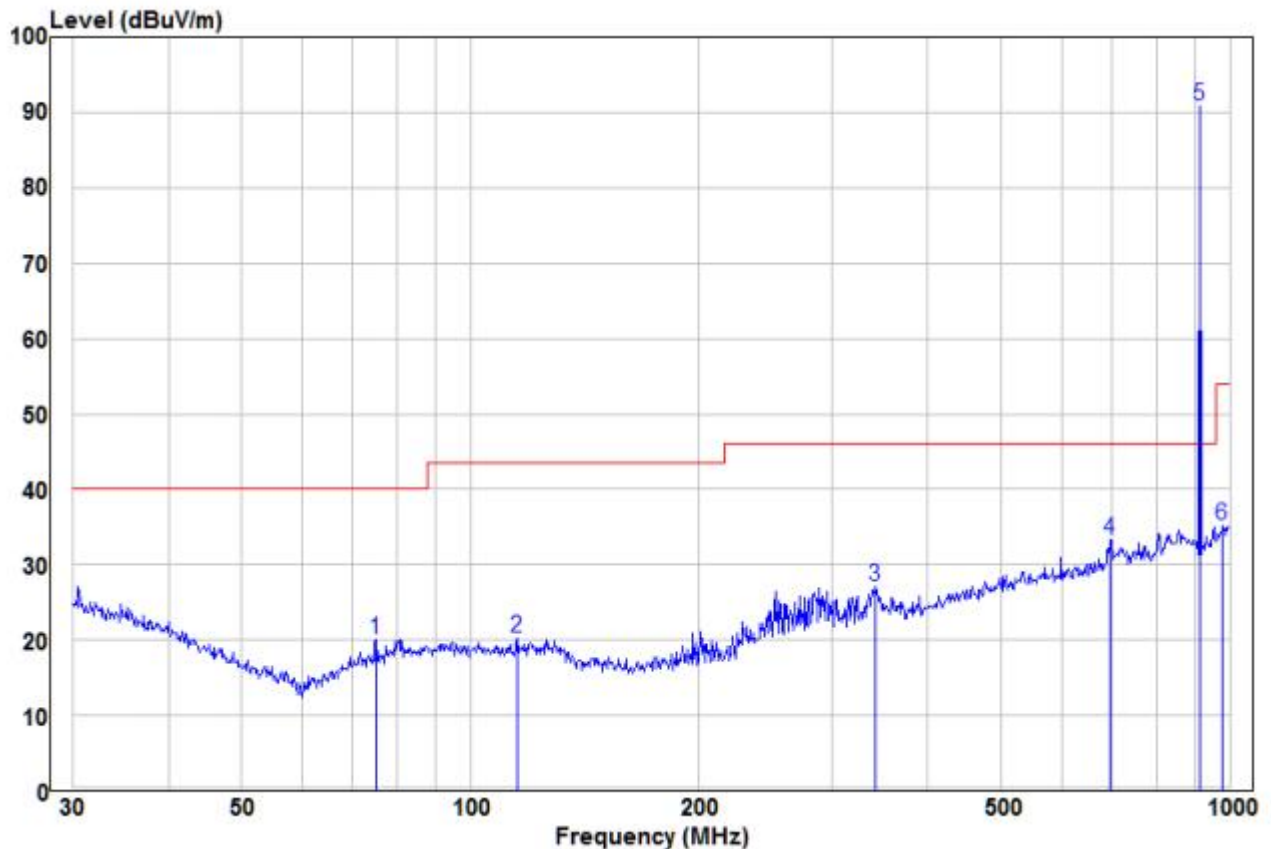
Test Procedure:

- a. 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
Note: For the radiated emission test above 1GHz:
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter)

		and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. g. Test the EUT in the lowest channel (2402MHz), the middle channel (2441MHz), the Highest channel (2480MHz) h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. i. Repeat above procedures until all frequencies measured was complete.
Exploratory Mode:	Test	Non-hopping transmitting mode with all kind of modulation and all kind of data type Transmitting mode, Charge + Transmitting mode.
Final Test Mode:		MAX MPE of Wi-Fi(2.4G)&Z-wave&PowerG &MAX MPELTE
Test Results:		Pass

5.3.1 Radiated Emission below 1GHz

30MHz~1GHz		
Test mode:	wireless transmission	Horizontal



	Freq	Read		Limit	Over		
	MHz	Level	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	75.18	11.03	9.00	20.03	40.00	-19.97	Peak
2	115.32	9.73	10.46	20.19	43.50	-23.31	Peak
3	341.98	12.24	14.76	27.00	46.00	-19.00	Peak
4	696.86	12.21	21.04	33.25	46.00	-12.75	Peak
5 pp	912.86	68.12	22.70	90.82	46.00	44.82	Peak
6	979.18	10.67	24.56	35.23	54.00	-18.77	Peak
							HORIZONTAL

Remark:

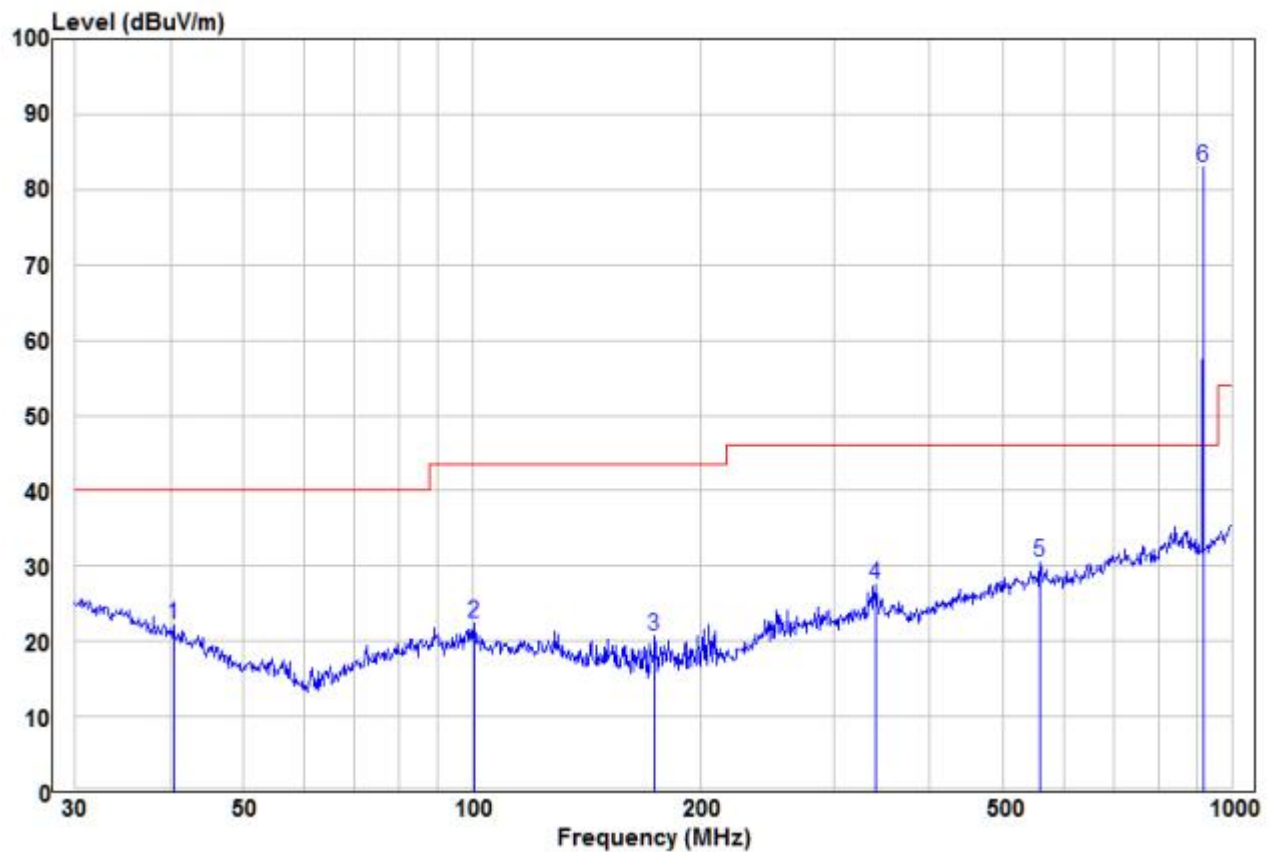
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

Test mode:	wireless transmission	Vertical
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	Read Freq	Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	40.42	9.67	12.60	22.27	40.00	-17.73	Peak	VERTICAL
2	100.58	11.78	10.62	22.40	43.50	-21.10	Peak	VERTICAL
3	173.81	12.85	7.90	20.75	43.50	-22.75	Peak	VERTICAL
4	339.59	12.74	14.70	27.44	46.00	-18.56	Peak	VERTICAL
5	558.73	11.66	18.89	30.55	46.00	-15.45	Peak	VERTICAL
6 pp	916.07	60.25	22.79	83.04	46.00	37.04	Peak	VERTICAL

Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

Note:912MHz and 916MHz appearing in the report are the main frequency signals of PowerG and can be exempted

5.3.2 Transmitter emission above 1GHz

Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4824.000	53.36	-4.26	49.10	74	-24.90	peak	H
4824.000	36.35	-4.26	32.09	54	-21.91	AVG	H
5550.000	51.21	1.18	52.39	68.8	-16.41	peak	H
4824.000	55.46	-4.26	51.20	74	-22.80	peak	V
4824.000	38.81	-4.26	34.55	54	-19.45	AVG	V
5550.000	51.15	1.18	52.33	68.8	-16.47	peak	V

Remark:

- 1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor
- 2) Scan from 9kHz to 25GHz, the disturbance above 10GHz and below 30MHz was very low. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

6 Photographs - EUT Test Setup

6.1 Radiated Emission

9KHz~30MHz:



30MHz~1GHz:



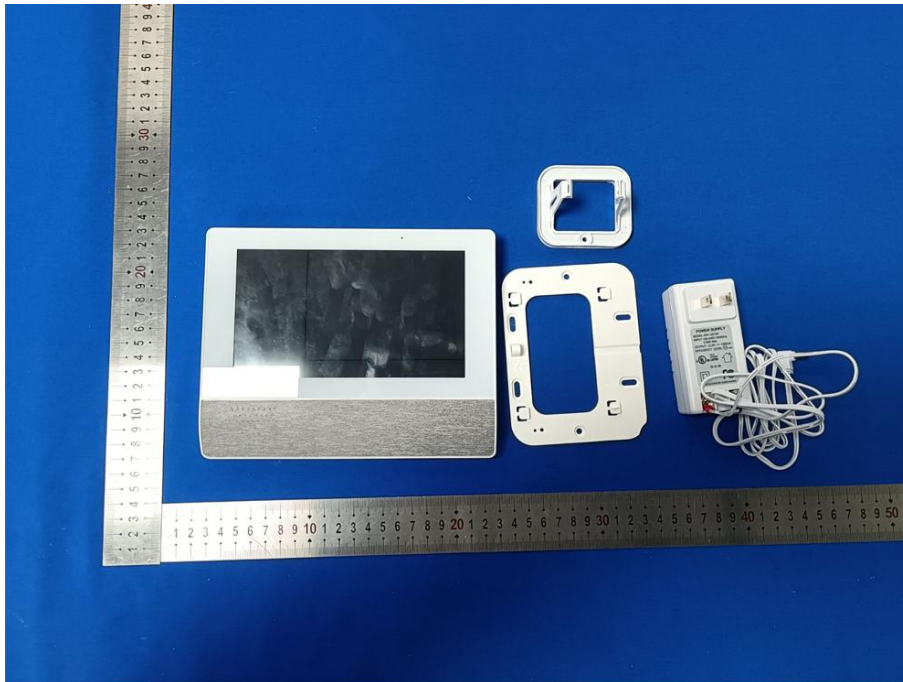
Above 1GHz:

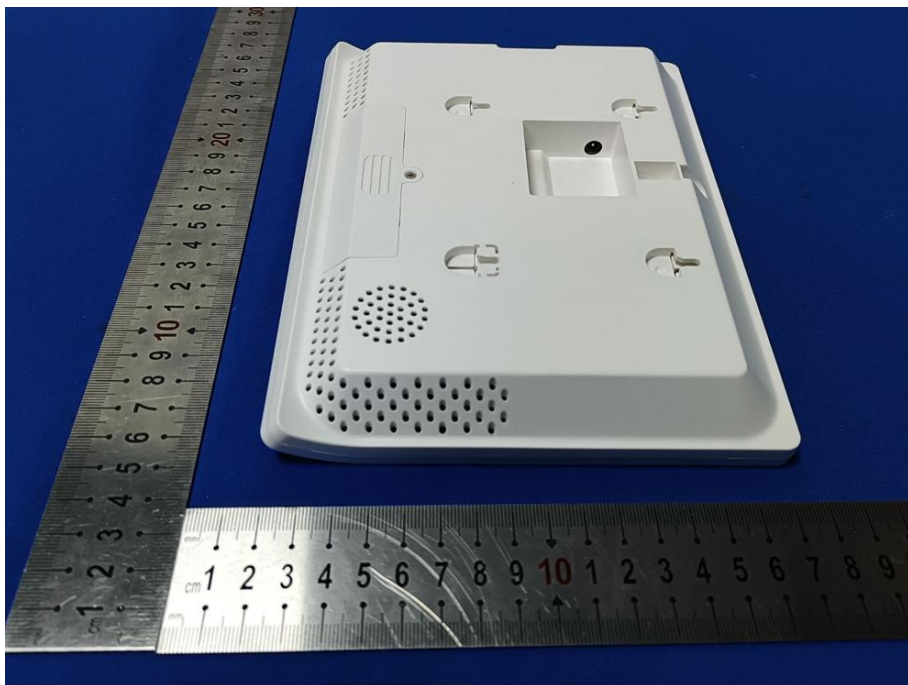
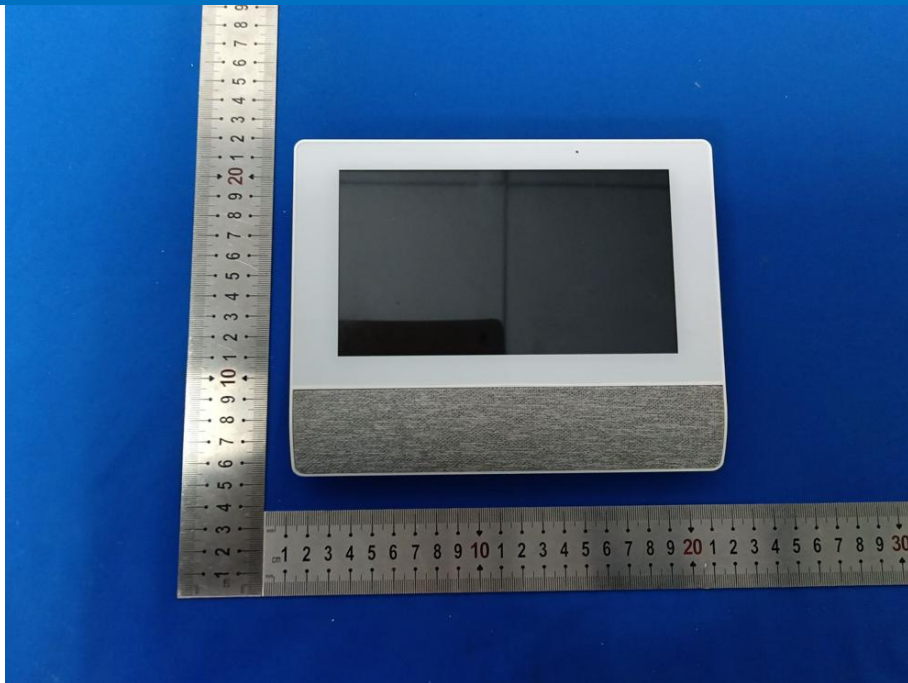


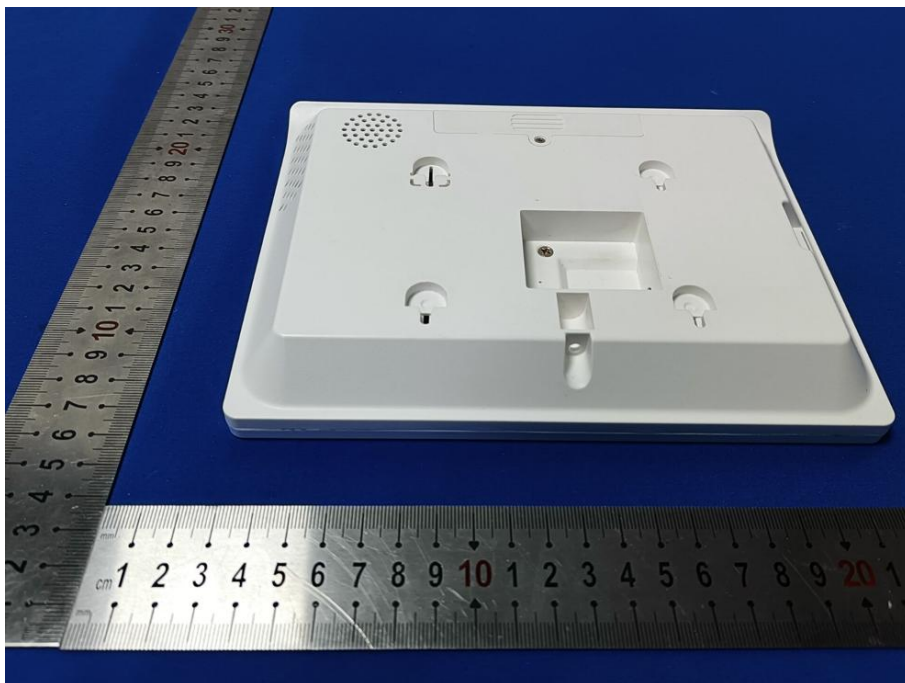
6.2 Conducted Emission

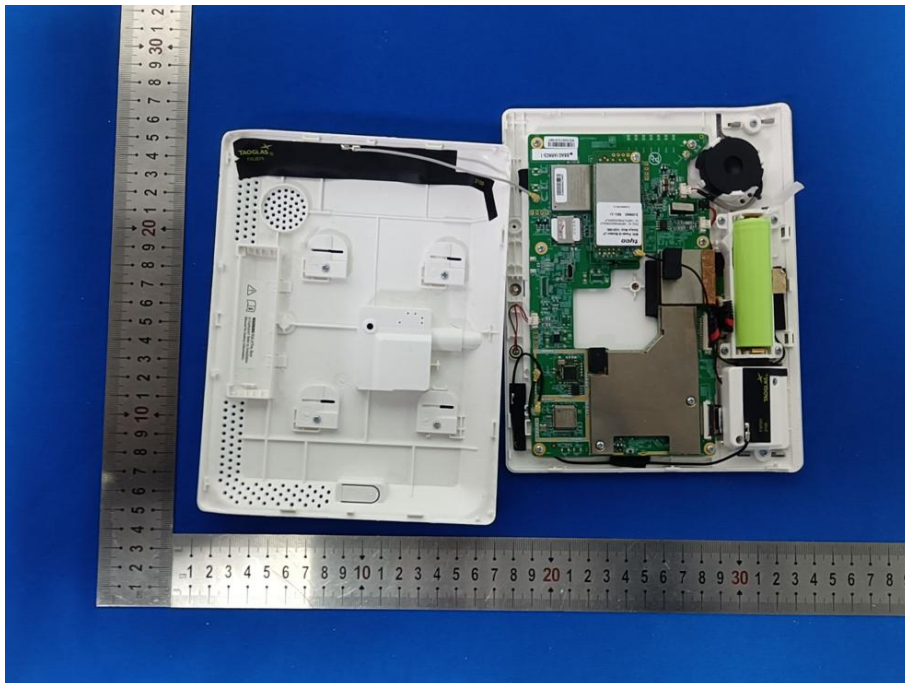
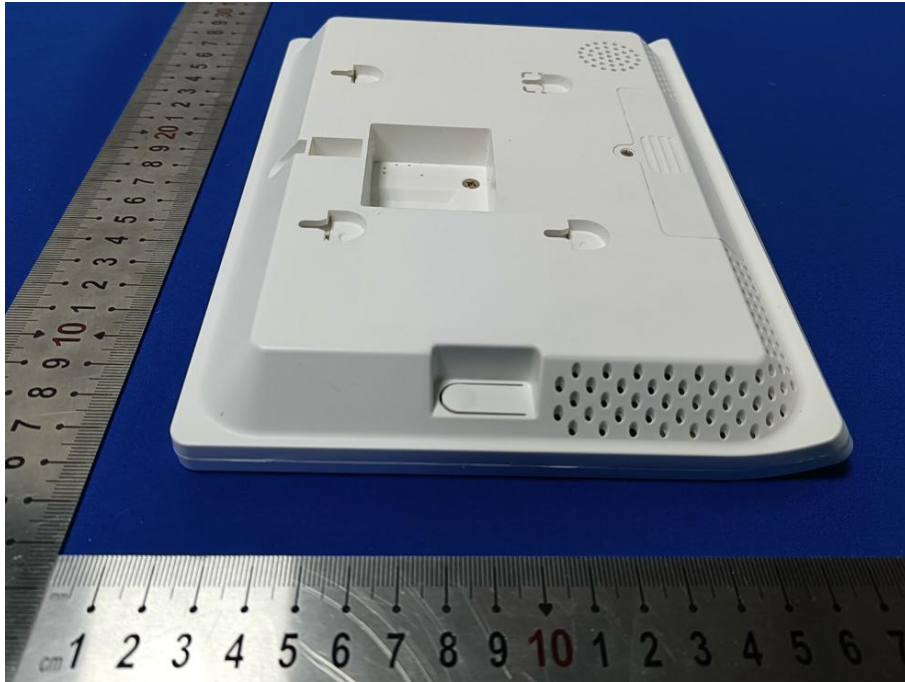


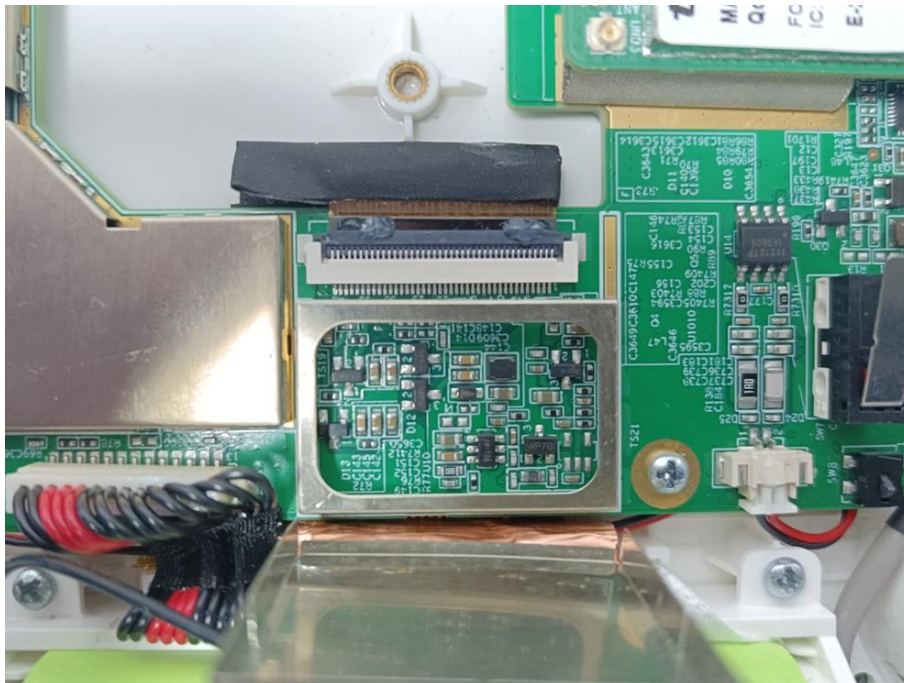
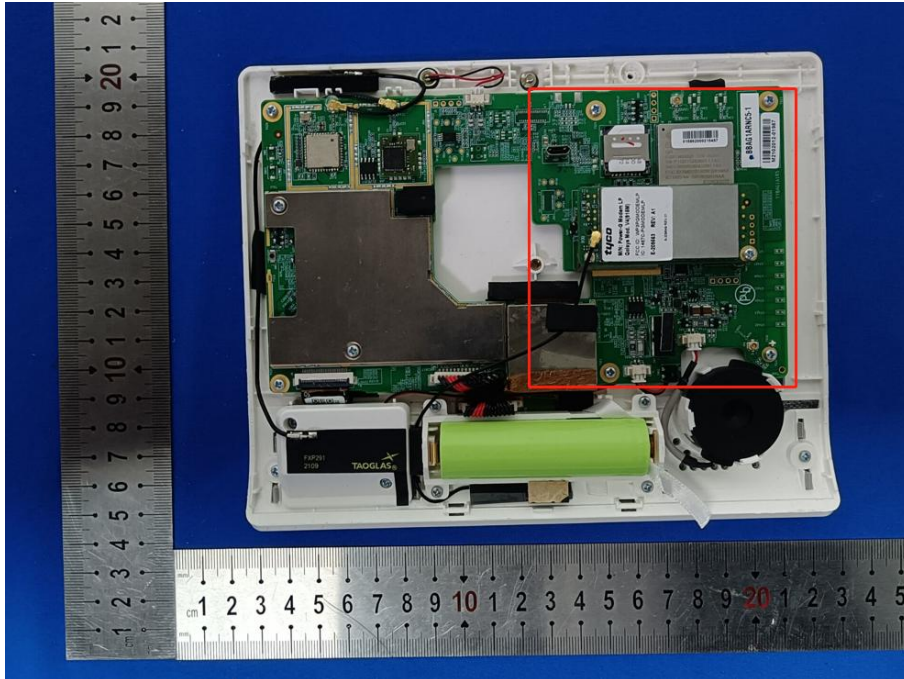
7 Photographs - EUT Constructional Details

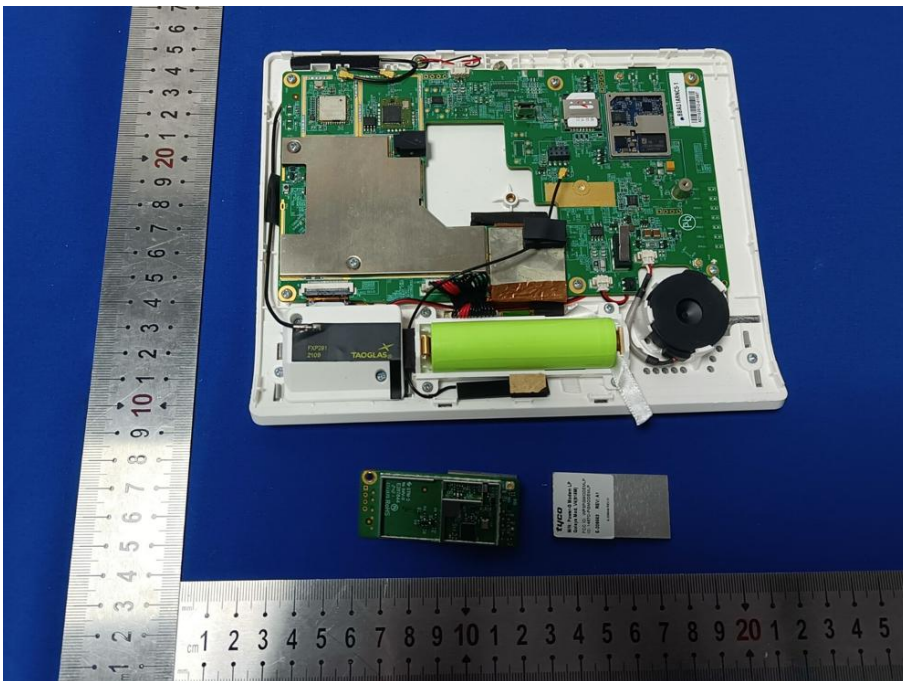
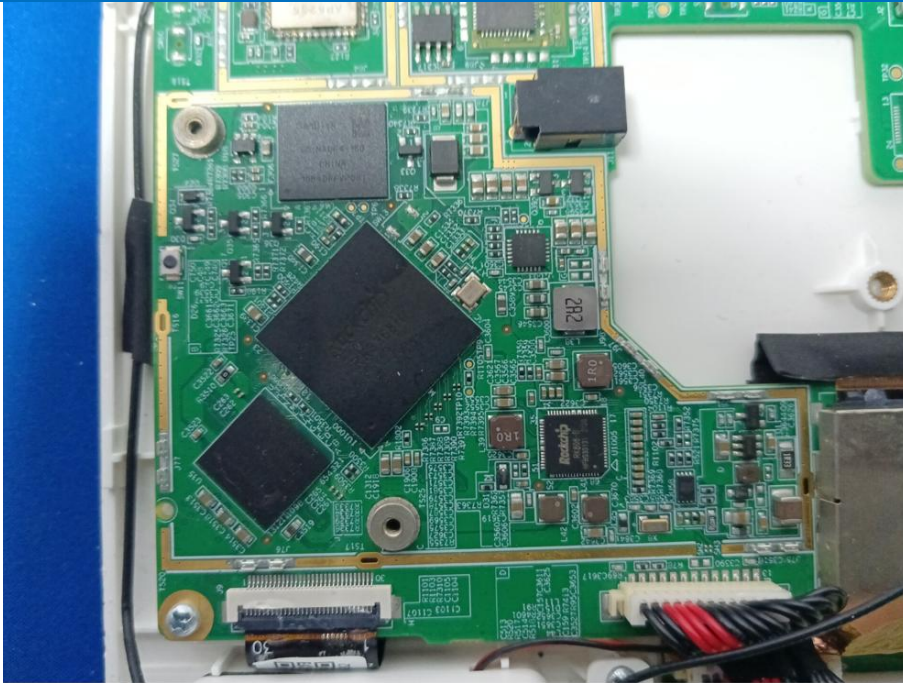


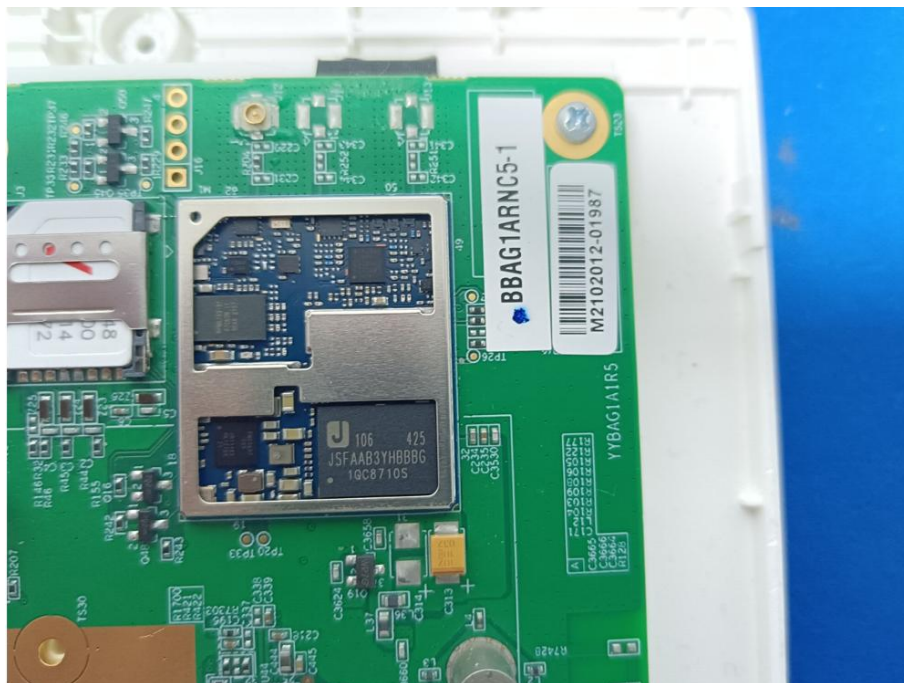


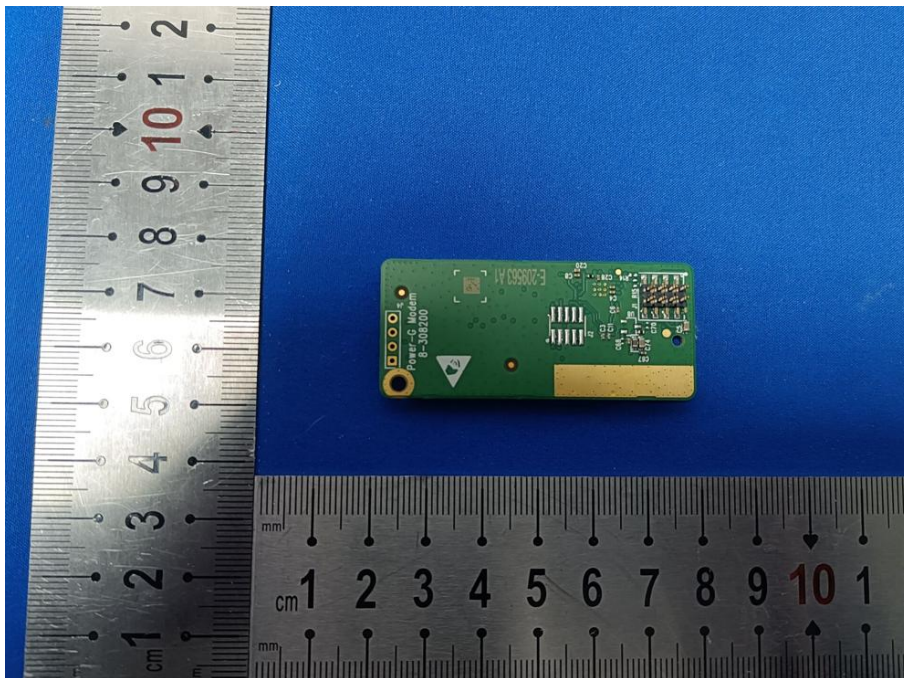
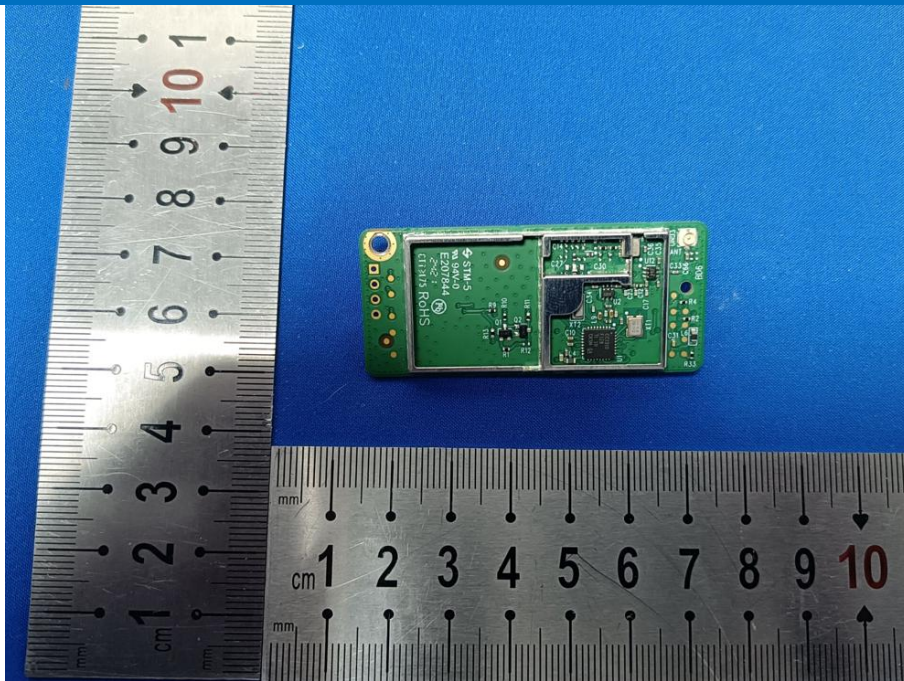


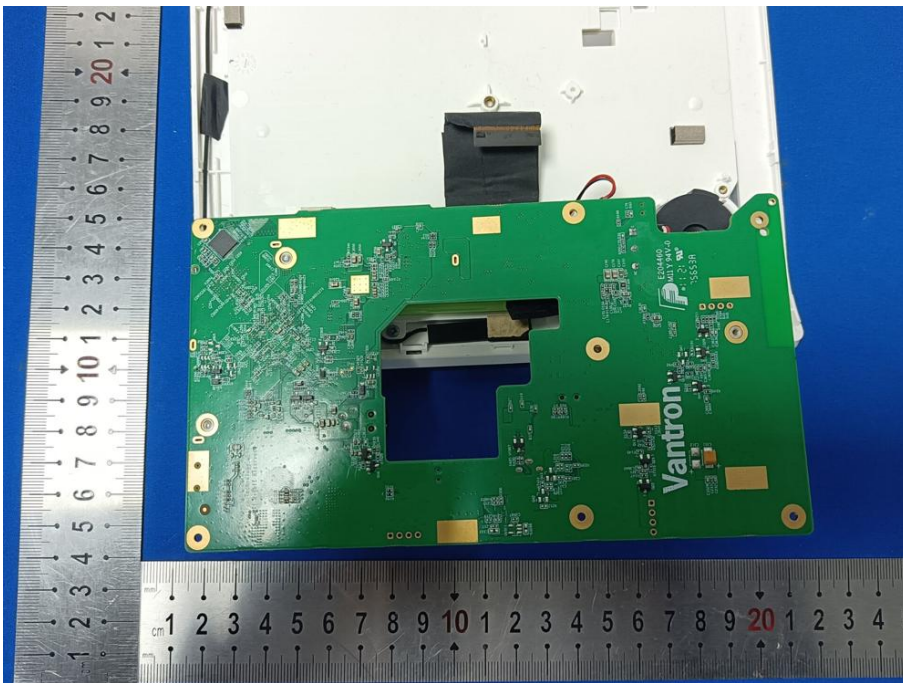












END OF REPORT