
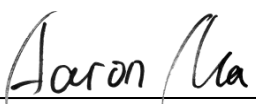


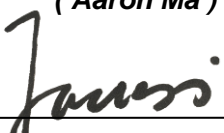
TEST REPORT

Report No. : CQASZ20191201316E-01
Applicant: SHENZHEN HUBSAN TECHNOLOGY CO., LTD
Address of Applicant: 13th Floor, Bldg 1C, Shenzhen Software Industry Base, Xuefu Road, Nanshan District, Shenzhen, China 518054
Equipment Under Test (EUT):
Product: HUBSAN ZINO 2
Model No.: ZINO 2
Brand Name: HUBSAN
Standards: EN 55032:2015
EN 55035:2017
EN 61000-3-2:2019
EN 61000-3-3:2013+A1:2019
Date of Receipt: 2019-12-16
Date of Test: 2019-12-16 to 2020-01-03
Date of Issue: 2020-01-03
Test Result : PASS*

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

Tested By: 
(Martin Lee)

Reviewed By: 
(Aaron Ma)

Approved By: 
(Jack Ai)



1 Version

Revision History of Report

Report No.	Version	Description	Issue Date
CQASZ20191201316E-01	Rev.01	Initial report	2020-01-03

2 Test Summary

Electromagnetic Compatibility (EMC) Part				
Electromagnetic Interference (EMI)				
Test item	Test Requirement	Test Method	Class / Severity	Result
Radiated Emission (30MHz to 6GHz)	EN 55032:2015	EN 55032:2015	Class B	PASS
Conducted Emission (150kHz to 30MHz)	EN 55032:2015	EN 55032:2015	Class B	PASS
Harmonic Emission on AC, 50Hz	EN 61000-3-2:2014	EN 61000-3-2:2019	Table 1 of EN 61000-3-2	N/A ²⁾
Flicker Emission on AC	EN 61000-3-3:2013	EN 61000-3-3:2013+A1:2019	Clause 5 of EN 61000-3-3	PASS
Electromagnetic Susceptibility (EMS)				
Electrostatic discharges (ESD)	EN 55035:2017	EN 61000-4-2:2009	Clause 5	PASS
Radiated Immunity	EN 55035:2017	EN 61000-4-3:2006 +A1:2008+A2:2010	Clause 5	PASS
Power frequency magnetic field	EN 55035:2017	EN 61000-4-8:2010	Clause 5	N/A ¹⁾
Electrical Fast Transients (EFT)	EN 55035:2017	EN 61000-4-4:2012	Clause 5	PASS
Surge Immunity	EN 55035:2017	EN 61000-4-5:2014	Clause 5	PASS
Injected Currents, 150kHz to 80MHz	EN 55035:2017	EN 61000-4-6:2014	Clause 5	PASS
Voltage Dips and Interruptions	EN 55035:2017	EN 61000-4-11:2004	Clause 5	PASS

Remark:

§ If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz. (Refer to EN 55032:2015 Clause 8 table 1 Conditional testing procedure)

§ If the highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz. (Refer to EN 55032:2015 Clause 8 table 1 Conditional testing procedure)

§ If the highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz. (Refer to EN 55032:2015 Clause 8 table 1 Conditional testing procedure)

§ If the highest frequency of the internal sources of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less. (Refer to EN 55032:2015 Clause 8 table 1 Conditional testing procedure)

N/A¹⁾: Because this test EUT is not belonging to apparatus containing devices susceptible to magnetic fields, therefore, it is not applicable.

N/A²⁾: Because the rated power of this product is less than 75W.

The highest frequency of the internal sources of the EUT is 5850 MHz.

The tested sample(s) and the sample information are provided by the client

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4 General Information

4.1 Client Information

Applicant:	SHENZHEN HUBSAN TECHNOLOGY CO., LTD
Address of Applicant:	13th Floor, Bldg 1C, Shenzhen Software Industry Base, Xuefu Road, Nanshan District, Shenzhen, China 518054
Manufacturer:	SHENZHEN HUBSAN TECHNOLOGY CO., LTD
Address of Manufacturer:	13th Floor, Bldg 1C, Shenzhen Software Industry Base, Xuefu Road, Nanshan District, Shenzhen, China 518054

4.2 General Description of EUT

Product Name:	HUBSAN ZINO 2	
Model No.:	ZINO 2	
Trade Mark:	HUBSAN	
Power Supply:	remote-control unit	Battery: 3.6V 3350 mAh Li-Po
	plane unit	Battery: 15.2 V 3800 mAh Li-Po Power Supply: MODEL: P173D3000 INPUT: 100-240V~50/60Hz 1.2A OUTPUT: 17.3V 3000mA
Test Voltage:	230V/50Hz, 110V/60Hz	
Test Mode:		
Charging1	Charge the remote-control unit	
Charging2	Charge the plane unit	

4.3 Description of Support Units

The EUT has been tested with associated equipment below.

1) support equipment

Description	Manufacturer	Model No.	Certification	Supplied by
Adapter	HUAWEI	LPL-C010050200Z	/	CQA

2) Cable

Cable No.	Description	Manufacturer	Cable Type/Length	Supplied by
/	/	/	/	/

4.1 Test Location

Other than radiated immunity, all tests were performed at:

Shenzhen Huaxia Testing Technology Co., Ltd.,

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

Radiated immunity test is performed at:

Guangdong Huizhou Quality & Measuring Supervision Testing Institute

Quality Supervision & Test Building No.1, Wenhua 2th Road, Jiangbei, Huizhou, Guangdong, China

4.2 Deviation from Standards

None.

4.3 Abnormalities from Standard Conditions

None.

4.4 Other Information Requested by the Customer

None.

4.5 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Conduction emission	3.74dB (9kHz to 150kHz)
		3.34dB (150kHz to 30MHz)
2	Radiated emission	5.12dB (30MHz-1GHz)
		4.60dB (1GHz-6GHz)
3	Radiated Immunity	1.61dB
4	Conducted Immunity	0.92dB
5	Temperature test	0.8°C
6	Humidity test	2.0%
7	DC power test	0.5 %

5 Equipment List

Conducted Emissions (150kHz-30MHz)					
Equipment	Manufacturer	Model No	Inventory No.	Cal Date	Cal Due Date
EMI Test Receiver	R&S	ESPI3	CQA-013	2019/9/26	2020/9/25
LISN	R&S	ENV216	CQA-003	2019/10/23	2020/10/22
Coaxial cable (9KHz~300MHz)	CQA	N/A	C021	2019/9/26	2020/9/25

Radiated Emissions					
Equipment	Manufacturer	Model No	Inventory No.	Cal Date	Cal Due Date
Loop antenna	SCHWARZBECK	FMZB 1516	CQA-060	2019/10/21	2020/10/20
Horn Antenna	R&S	BBHA 9170	CQA-088	2019/9/25	2020/9/24
Horn Antenna	R&S	HF906	CQA-012	2019/9/26	2020/9/25
Bilog Antenna	R&S	HL562	CQA-011	2019/9/26	2020/9/25
EMI Test Receiver	R&S	ESR7	CQA-005	2019/10/25	2020/10/24
Spectrum analyzer	R&S	FSU26	CQA-038	2019/10/25	2020/10/24
Preamplifier	MITEQ	AMF-6D- 02001800- 29-20P	CQA-036	2019/10/25	2020/10/24
Coaxial cable (1GHz~40GHz)	CQA	N/A	C007	2019/9/26	2020/9/25
Coaxial cable (9KHz~1GHz)	CQA	N/A	C013	2019/9/26	2020/9/25

Harmonic Current & Voltage Fluctuation and Flicker					
Equipment	Manufacturer	Model No	Inventory No.	Cal Date	Cal Due Date
Harmonic And Flicker Analyzer	CI	PACS-3	CQA-021	2019/10/23	2020/10/22
AC Power Supply	CI	5001 ix	CQA-073	2019/10/23	2020/10/22

Electrostatic Discharge					
Equipment	Manufacturer	Model No	Inventory No.	Cal Date	Cal Due Date
ESD Simulator	EM TEST	DITO	CQA-001	2019/9/26	2020/9/25

Electrical Fast Transients/Burst & Surge & Voltage Dips and Interruptions at Power Port					
Equipment	Manufacturer	Model No	Inventory No.	Cal Date	Cal Due Date
EMS test system	HTEC	ECOMPACT 7	CQA-002	2019/9/25	2020/9/24
Communications surge generator	HTEC	HTSG 70	CQA-063	2019/9/25	2020/9/24
Capacitive Coupling Clamp	HTC	H3C	CQA-018	2019/10/30	2020/10/29

Conducted Immunity (150kHz-80MHz)					
Equipment	Manufacturer	Model No	Inventory No.	Cal Date	Cal Due Date
RF-Generator	EM TEST	CWS 500	CQA-016	2019/10/23	2020/10/22
6db Attenuator	EM TEST	ATT6/75	CQA-049	2019/9/26	2020/9/25
CDN	SCHWARZBECK	CDN M2/M3PE	CQA-050	2019/10/25	2020/10/24

Guangdong Huizhou Quality & Measuring Supervision Testing Institute:

Radiated Immunity (80MHz-6GHz)					
Equipment	Manufacturer	Model No	Inventory No.	Cal Date	Cal Due Date
3m Anechoic Chamber	Albatross	APC13102-SAC	Z-064	2017/12/2	2020/12/1
Signal Generator	R&S	SMB100A	Z-063-01	2019/4/18	2020/4/17
Power amplifier	R&S	BBA150-BC1000	Z-140	2019/6/2	2020/6/1
Power amplifier	R&S	BBA150-D200+E200	Z-144	2019/11/28	2020/11/27
log-periodic antenna	R&S	HL046E	Z-063-18	2019/4/19	2021/4/18
Stacked Double Log-periodic Antenna	Schwarzbeck	STLP 9149	Z-063-19	2019/4/19	2021/4/18
Power Meter	R&S	NRP2	Z-063-06	2019/6/2	2020/6/1
Audio mouth	BK	BK-4227	Z-063-23	2019/4/19	2020/4/18
Audio Box	BK	ACO-B0X	Z-063-24	2019/4/19	2020/4/18
Audio analyzer	R&S	UPL	Z-063-76	2019/4/19	2020/4/18

6 Emission Test Results

6.1 Radiated Emissions

Test Requirement: EN 55032

Test Method: EN 55032

Measurement Distance: 3m

EUT Operation:

Ambient: Temp.: 25.2°C

Humid.: 52%

Press.: 1015mbar

Test Mode: Charging1, Charging2

Receive Setup:

Frequency range (MHz)	Detector	RBW	VBW
30-1000	Quasi-peak	120kHz	300kHz
Above 1000	Peak	1MHz	3MHz

Limit:

Table 1: Requirements for radiated emissions for Class B equipment

Frequency	Limit(@3m)	Detector
30MHz-230MHz	40dBμV/m	QP
230MHz-1GHz	47dBμV/m	QP
1GHz-3GHz	50dBμV/m	Average
	70dBμV/m	PK
3GHz-6GHz	54dBμV/m	Average
	74dBμV/m	PK

Test Setup:

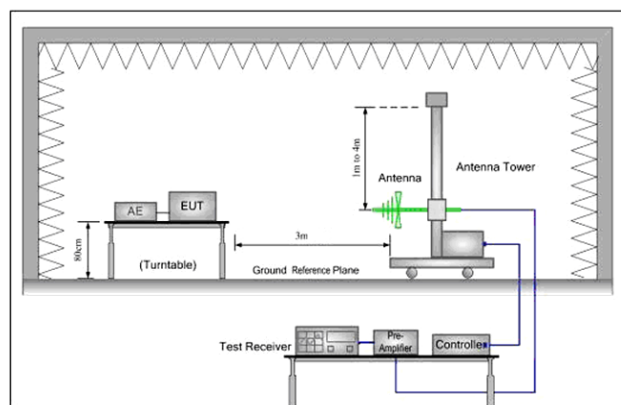


Figure 1. 30MHz to 1GHz

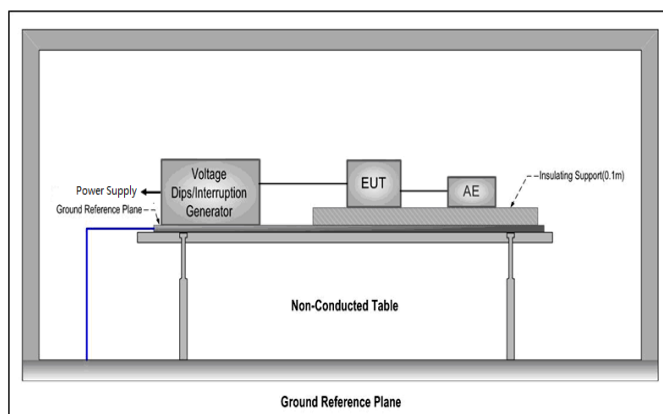


Figure 2. Above 1 GHz

Test Procedure:

- From 30 MHz to 1GHz test procedure as below:
 - The radiated emissions were tested in a semi-anechoic chamber.
 - The EUT is placed on a turntable, which is 0.8m above ground plane.
 - The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
 - EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
 - Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
 - And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
 - Repeat above procedures until the measurements for all frequencies are complete.

2. Above 1GHz test procedure as below:

- 1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber

Equipment Used:

Refer to section 5 for details.

Test result:

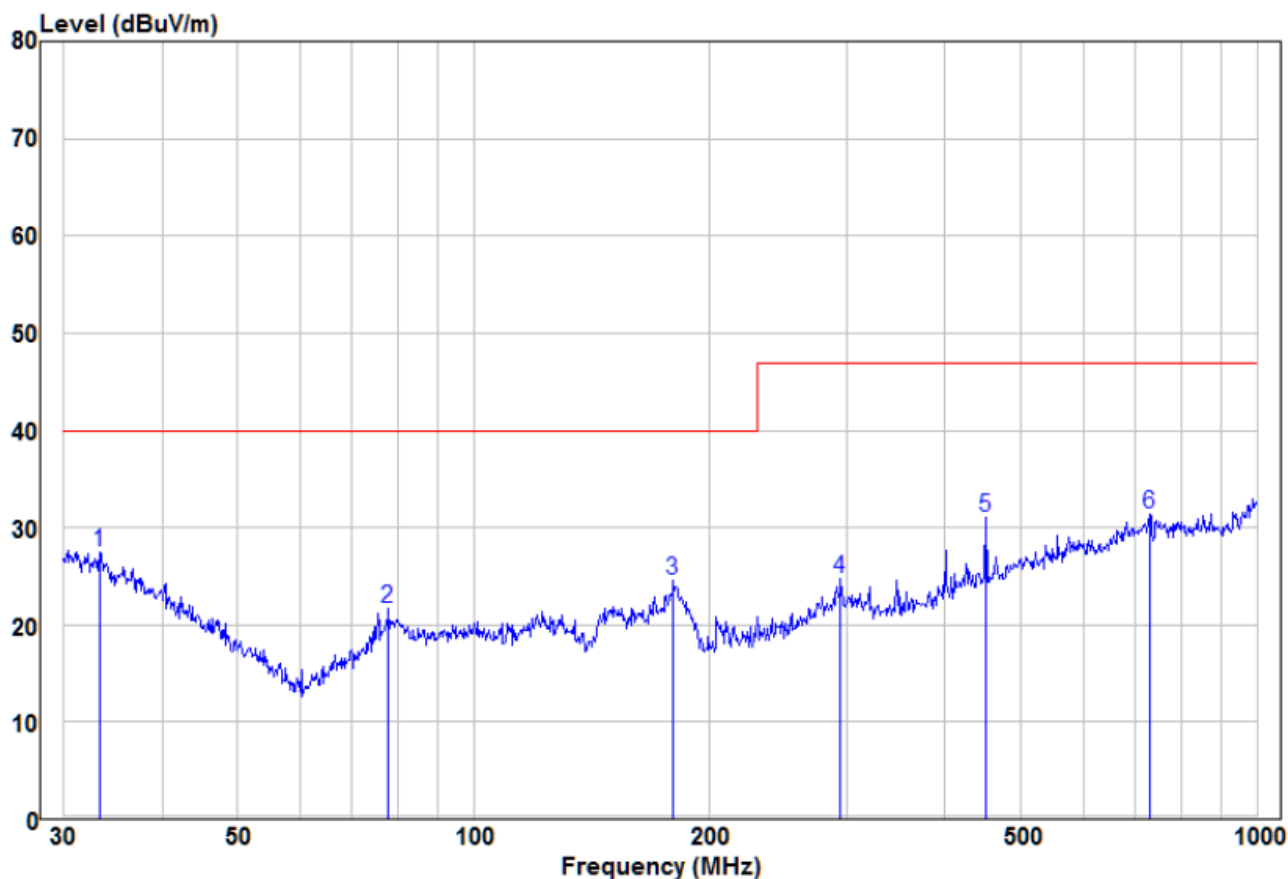
PASS

Measurement Data:

Below 1GHz:

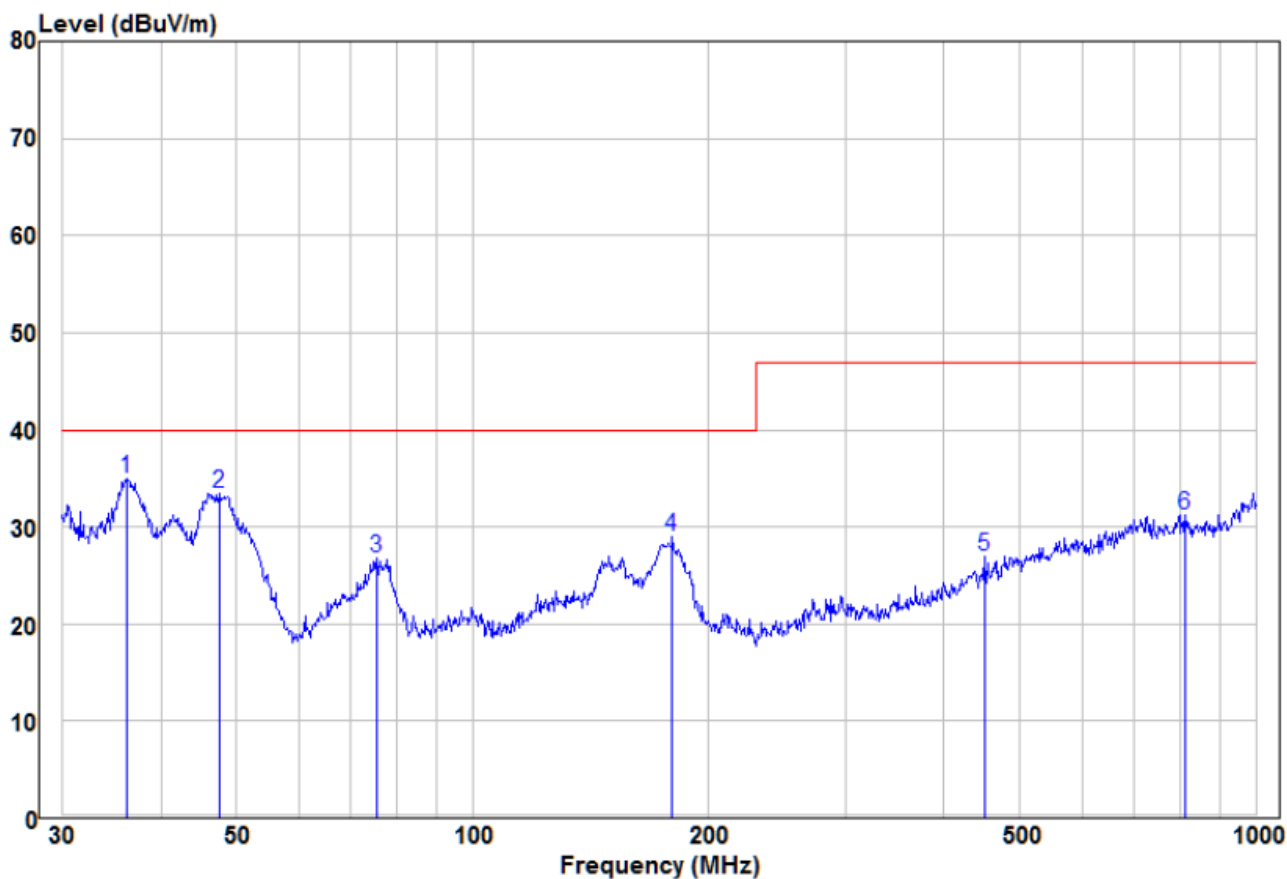
Charging1:

Horizontal:



		Read		Limit	Over		
	Freq	Level	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Pol/Phase
1	pp	33.33	10.28	17.21	27.49	40.00	-12.51 Peak
2		77.87	12.21	9.44	21.65	40.00	-18.35 Peak
3		180.02	16.28	8.34	24.62	40.00	-15.38 Peak
4		294.11	13.12	11.54	24.66	47.00	-22.34 Peak
5		451.14	15.32	15.76	31.08	47.00	-15.92 Peak
6		729.36	11.09	20.29	31.38	47.00	-15.62 Peak

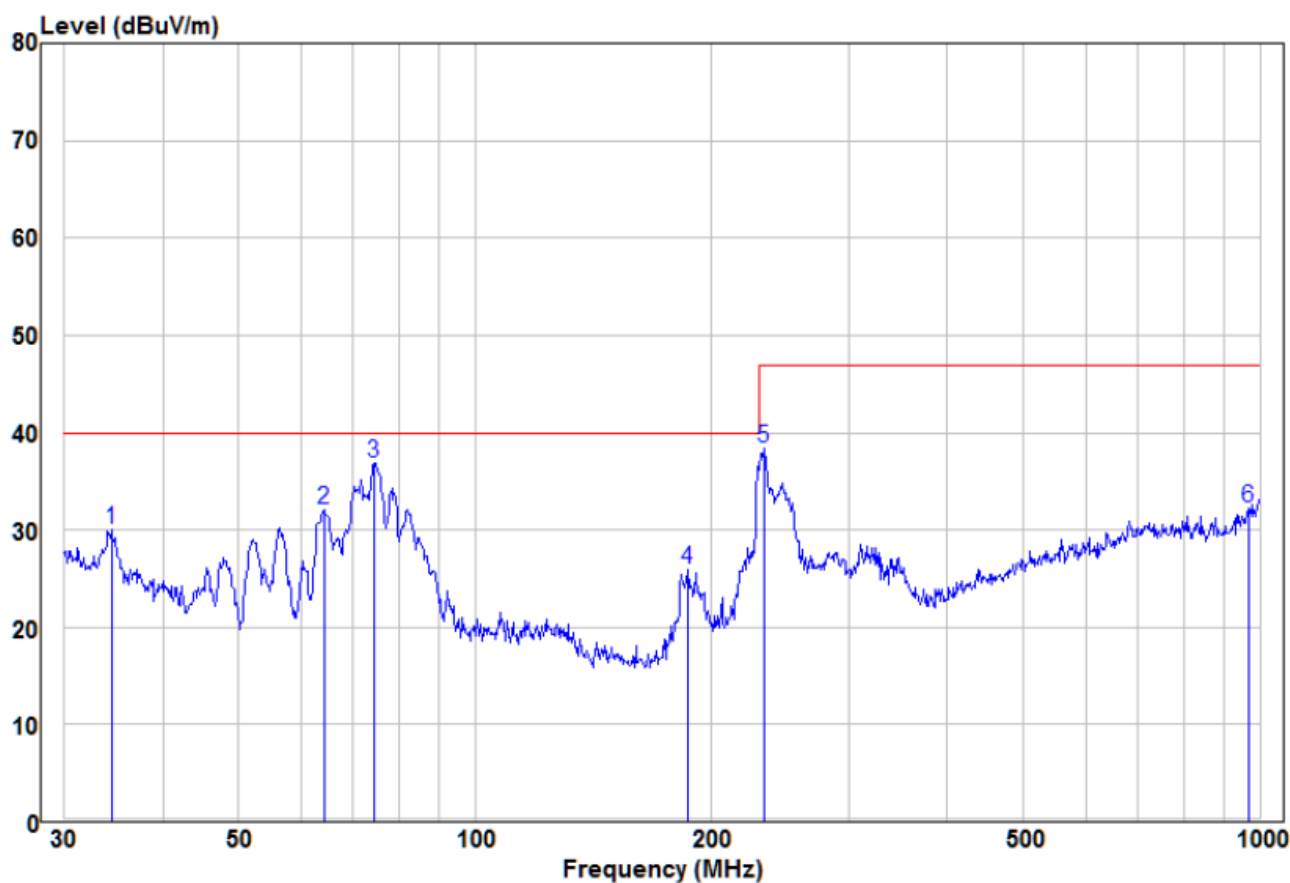
Vertical:



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1 pp	36.13	18.79	16.19	34.98	40.00	-5.02	Peak	VERTICAL
2	47.49	22.99	10.52	33.51	40.00	-6.49	Peak	VERTICAL
3	75.45	17.82	9.04	26.86	40.00	-13.14	Peak	VERTICAL
4	180.02	20.67	8.34	29.01	40.00	-10.99	Peak	VERTICAL
5	451.14	11.18	15.76	26.94	47.00	-20.06	Peak	VERTICAL
6	813.11	10.53	20.75	31.28	47.00	-15.72	Peak	VERTICAL

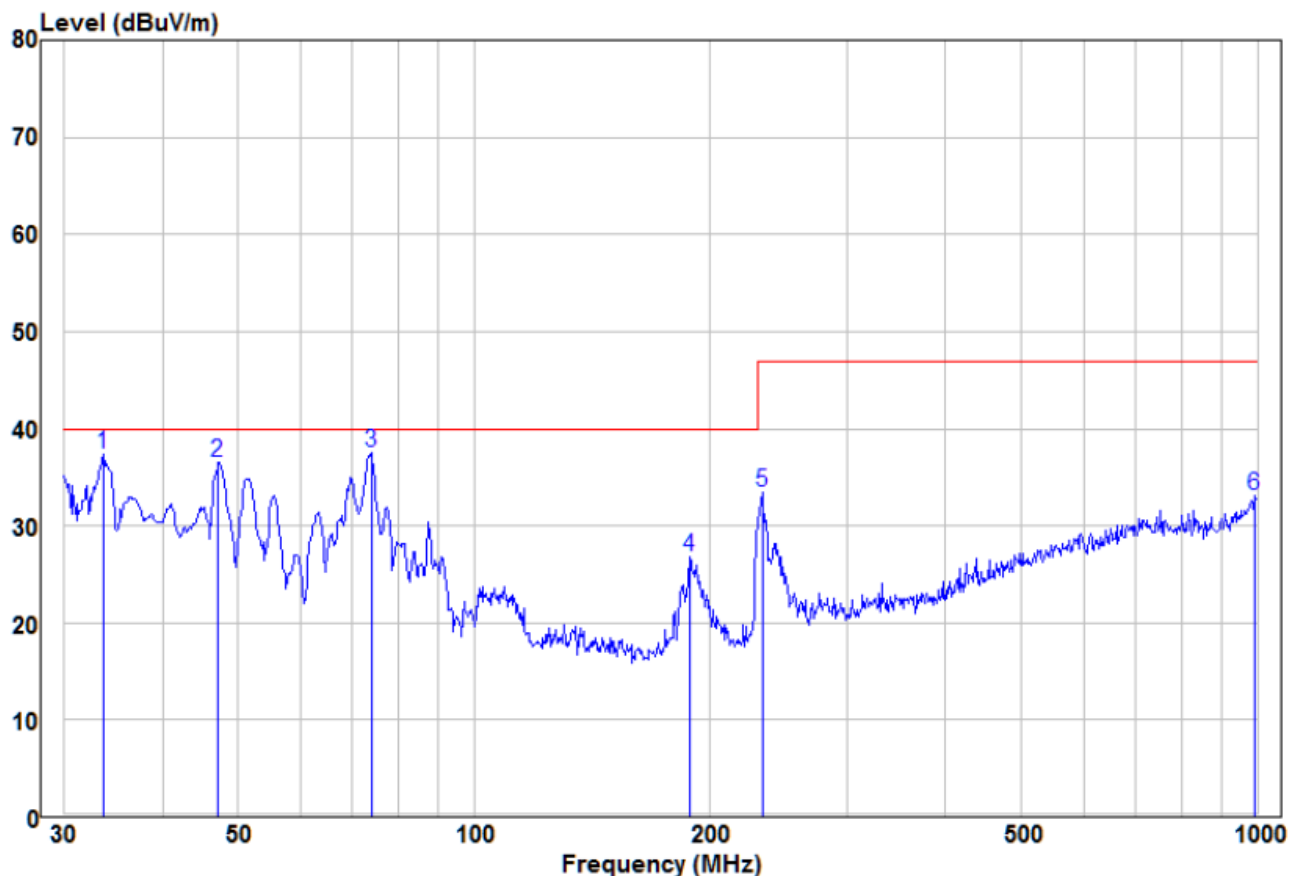
Charging2:

Horizontal:



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	34.40	13.17	16.83	30.00	40.00	-10.00	Peak	HORIZONTAL
2	64.21	25.65	6.34	31.99	40.00	-8.01	Peak	HORIZONTAL
3 pp	74.40	27.98	8.87	36.85	40.00	-3.15	Peak	HORIZONTAL
4	187.10	17.78	8.08	25.86	40.00	-14.14	Peak	HORIZONTAL
5	233.35	28.82	9.55	38.37	47.00	-8.63	Peak	HORIZONTAL
6	968.93	10.03	22.27	32.30	47.00	-14.70	Peak	HORIZONTAL

Vertical:



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	33.68	20.28	17.09	37.37	40.00	-2.63	Peak	VERTICAL
2	47.16	25.79	10.71	36.50	40.00	-3.50	Peak	VERTICAL
3 pp	73.88	28.80	8.79	37.59	40.00	-2.41	Peak	VERTICAL
4	188.41	18.69	8.02	26.71	40.00	-13.29	Peak	VERTICAL
5	233.35	23.83	9.55	33.38	47.00	-13.62	Peak	VERTICAL
6	993.01	10.21	22.94	33.15	47.00	-13.85	Peak	VERTICAL

Above 1GHz:

Charging1:

Class B: Above 1GHz : at 3M							
Ant.Pol.	Frequency	Measurement (dBuV)		Limit 3m(dBuV/m)		Over(dB)	
	MHz	PK	AV	PK	AV	PK	AV
Horizontal	1492.76	51.06	35.01	70	50	-18.94	-14.99
	2091.98	52.00	36.01	70	50	-18.00	-13.99
	4457.06	59.79	37.42	74	54	-14.21	-16.58
Vertical	1633.48	51.06	37.41	70	50	-18.94	-12.59
	2319.71	55.45	36.06	70	50	-14.55	-13.94
	4685.54	56.12	39.16	74	54	-17.88	-14.84

Charging2:

Class B: Above 1GHz : at 3M							
Ant.Pol.	Frequency	Measurement (dBuV)		Limit 3m(dBuV/m)		Over(dB)	
	MHz	PK	AV	PK	AV	PK	AV
Horizontal	1698.18	52.57	38.00	70	50	-17.43	-12.00
	2028.83	53.22	37.11	70	50	-16.78	-12.89
	4033.99	59.66	39.79	74	54	-14.34	-14.21
Vertical	1756.45	52.66	36.68	70	50	-17.34	-13.32
	2301.98	53.49	37.49	70	50	-16.51	-12.51
	4849.42	59.38	38.01	74	54	-14.62	-15.99

Remark: The EUT was test at 3m in field chamber.

Level = Read Level + Antenna Factor + Cable Loss – Preamp Factor.

1)Pertest the EUT at voltages of 230V and 110V, using a frequency of 50Hz or 60Hz, but find the voltages of 230V and the frequency of 50Hz which is worst case, only the data of the worst-case show in the test report.

distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

Test result: PASS

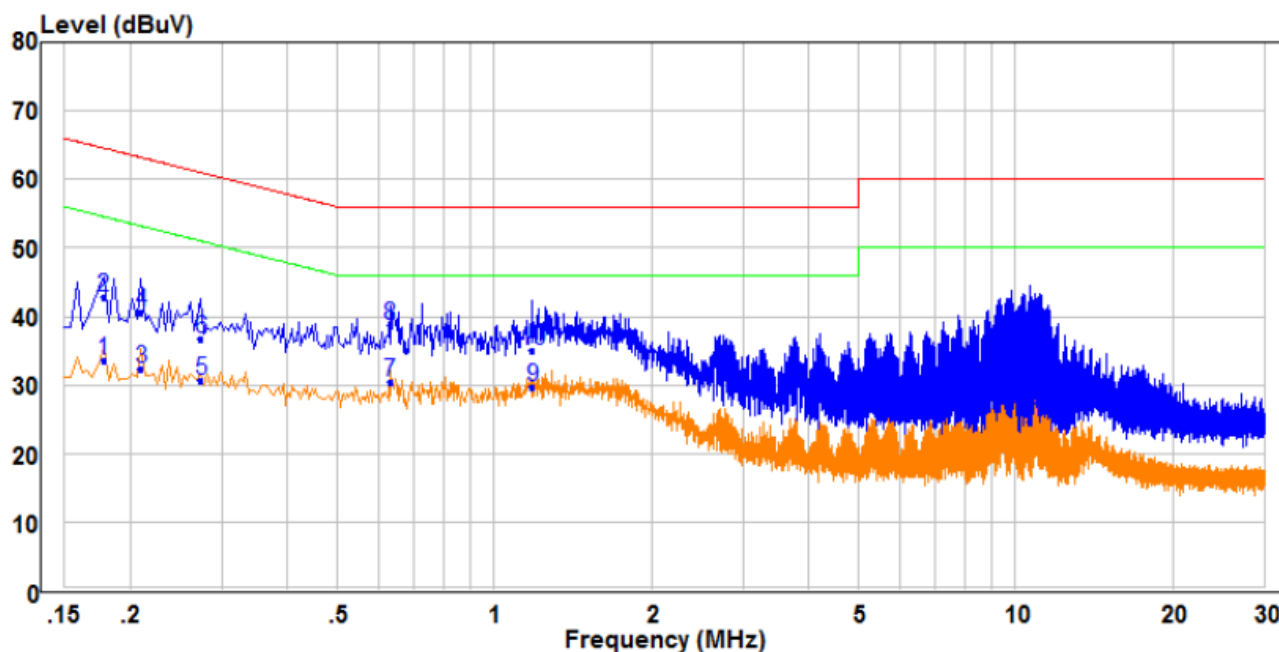
Measurement Data:

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

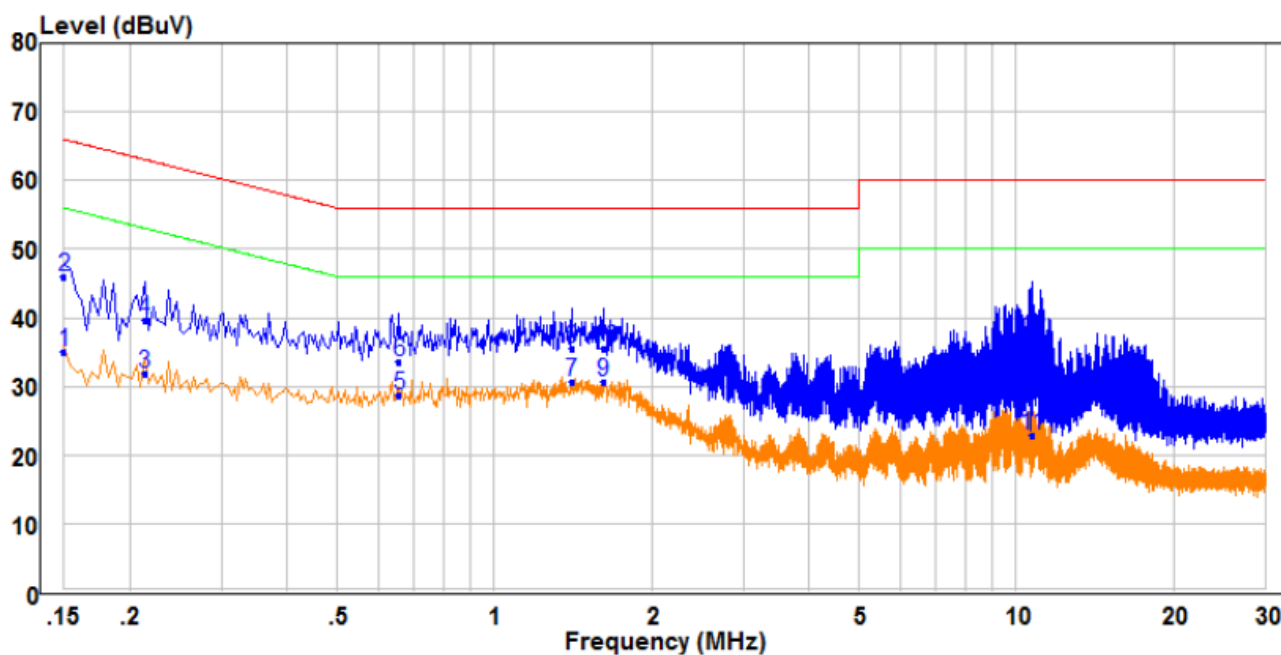
Charging1:

Live Line:



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB		
1	0.178	24.14	9.49	33.63	54.58	-20.95	Average	Line
2	0.178	33.43	9.49	42.92	64.58	-21.66	QP	Line
3	0.210	22.92	9.49	32.41	53.21	-20.80	Average	Line
4	0.210	31.23	9.49	40.72	63.21	-22.49	QP	Line
5	0.274	21.16	9.49	30.65	51.00	-20.35	Average	Line
6	0.274	27.12	9.49	36.61	61.00	-24.39	QP	Line
7 PP	0.630	20.64	9.75	30.39	46.00	-15.61	Average	Line
8 QP	0.630	28.93	9.75	38.68	56.00	-17.32	QP	Line
9	1.182	20.19	9.53	29.72	46.00	-16.28	Average	Line
10	1.182	25.60	9.53	35.13	56.00	-20.87	QP	Line
11	10.685	14.71	9.82	24.53	50.00	-25.47	Average	Line
12	10.685	27.99	9.82	37.81	60.00	-22.19	QP	Line

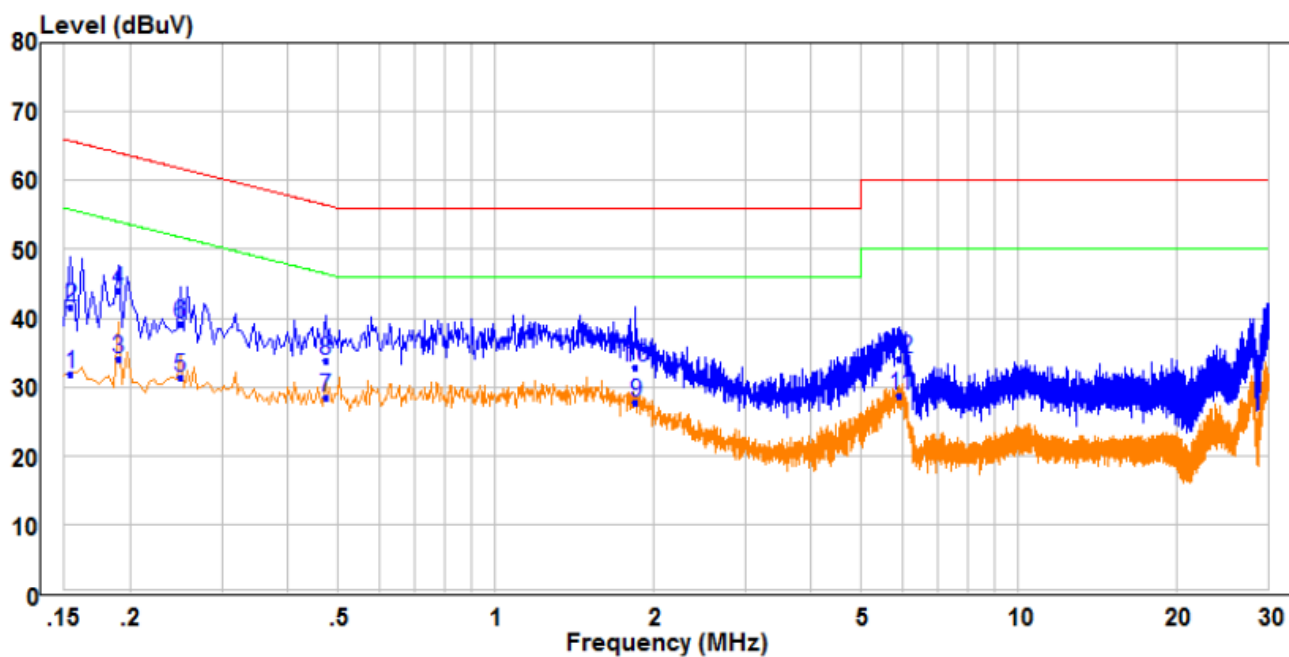
Neutral Line:



		Read			Limit	Over		
	Freq	Level	Factor	Level	Line	Limit	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB		
1	0.150	25.57	9.48	35.05	56.00	-20.95	Average	Neutral
2	QP	0.150	36.40	9.48	45.88	66.00	-20.12	QP
3	0.214	22.37	9.48	31.85	53.05	-21.20	Average	Neutral
4	0.214	30.08	9.48	39.56	63.05	-23.49	QP	Neutral
5	0.658	18.96	9.78	28.74	46.00	-17.26	Average	Neutral
6	0.658	23.90	9.78	33.68	56.00	-22.32	QP	Neutral
7	PP	1.406	20.85	9.72	30.57	46.00	-15.43	Average
8	1.406	25.78	9.72	35.50	56.00	-20.50	QP	Neutral
9	1.618	20.84	9.72	30.56	46.00	-15.44	Average	Neutral
10	1.618	25.90	9.72	35.62	56.00	-20.38	QP	Neutral
11	10.721	12.97	9.95	22.92	50.00	-27.08	Average	Neutral
12	10.721	27.05	9.95	37.00	60.00	-23.00	QP	Neutral

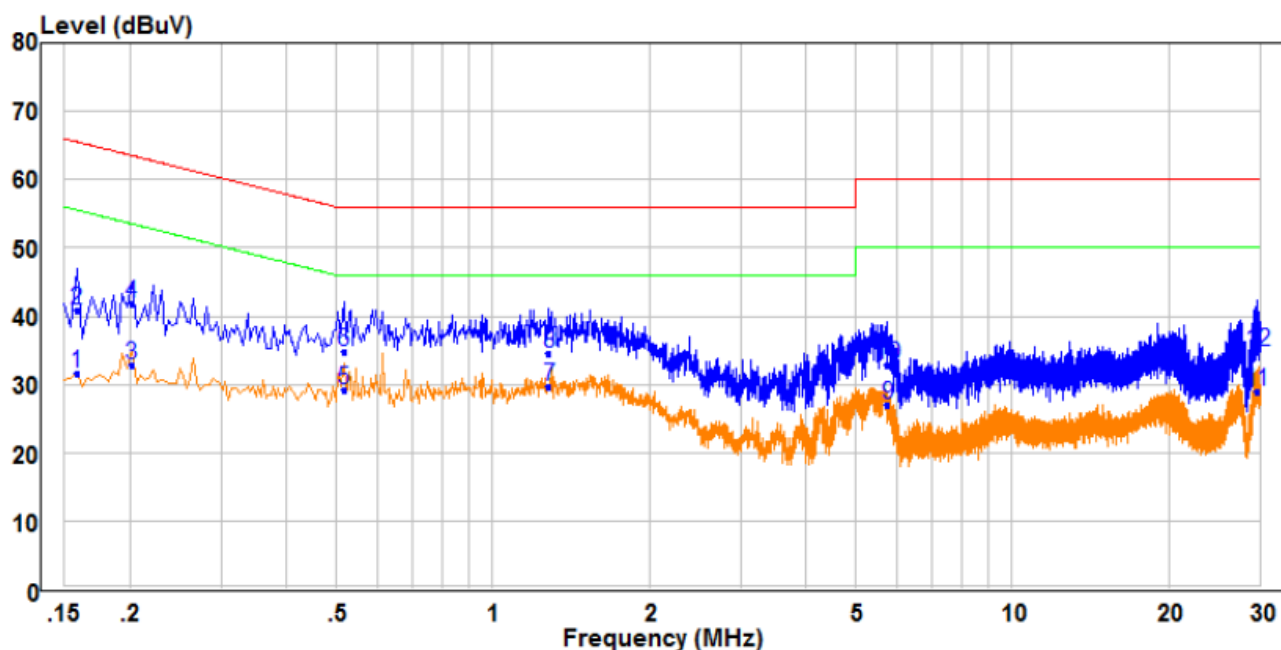
Charging2:

Live Line:



	Freq	Read		Limit	Over		
	MHz	Level	Factor	Line	Limit	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dB		
1	0.154	22.45	9.49	31.94	55.78	-23.84	Average
2	0.154	32.04	9.49	41.53	65.78	-24.25	QP
3	0.190	24.65	9.49	34.14	54.04	-19.90	Average
4 QP	0.190	34.60	9.49	44.09	64.04	-19.95	QP
5	0.250	21.95	9.49	31.44	51.76	-20.32	Average
6	0.250	29.75	9.49	39.24	61.76	-22.52	QP
7 PP	0.474	19.04	9.52	28.56	46.44	-17.88	Average
8	0.474	24.26	9.52	33.78	56.44	-22.66	QP
9	1.854	18.28	9.53	27.81	46.00	-18.19	Average
10	1.854	23.27	9.53	32.80	56.00	-23.20	QP
11	5.934	18.99	9.73	28.72	50.00	-21.28	Average
12	5.934	24.32	9.73	34.05	60.00	-25.95	QP

Neutral Line:



	Freq	Read		Limit	Over		
	MHz	Level	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	Pol/Phase
1	0.158	22.06	9.48	31.54	55.57	-24.03	Average
2	0.158	31.35	9.48	40.83	65.57	-24.74	QP
3	0.202	23.24	9.48	32.72	53.53	-20.81	Average
4	0.202	32.42	9.48	41.90	63.53	-21.63	QP
5	0.518	19.68	9.61	29.29	46.00	-16.71	Average
6 QP	0.518	25.14	9.61	34.75	56.00	-21.25	QP
7 PP	1.282	19.88	9.71	29.59	46.00	-16.41	Average
8	1.282	24.87	9.71	34.58	56.00	-21.42	QP
9	5.762	17.26	9.80	27.06	50.00	-22.94	Average
10	5.762	23.11	9.80	32.91	60.00	-27.09	QP
11	29.592	18.79	10.17	28.96	50.00	-21.04	Average
12	29.592	24.59	10.17	34.76	60.00	-25.24	QP

Remark

Pretest the EUT at voltages of 230V and 110V, using a frequency of 50Hz or 60Hz, but find the voltages of 230V and the frequency of 50Hz which is worst case, only the data of the worst case show in the test report.

6.3 Harmonics Test Results

Test Requirement: EN 61000-3-2

Test Method: EN 61000-3-2

Measurement Time: 3 mins

Classification: Class A

Remark:

There is no need for Harmonics test to be performed on this product (rated power is less than 75W) in accordance with EN 61000-3-2.

For further details, please refer to Clause 7 of EN 61000-3-2 which states:

“For the following categories of equipment, limits are not specified in this standard.

- equipment with a rated power of 75W or less, other than lighting equipment.”

Table 1 – Limits for Class A and B equipment

Table 2 – Limits for Class C equipment

Table 3 – Limits for Class D equipment

Class A:

- Balanced three-phase equipment;
- Household appliances, excluding equipment identified as class D;
- Tools, excluding portable tools;
- Dimmers for incandescent lamps;
- Audio equipment.

Class B:

- Portable tools;
- Arc welding equipment which is not professional equipment.

Class C:

- lighting equipment.

Class D:

Equipment having a specified power according to 6.2.2 less than or equal to 600 W, of the following types:

- Personal computers and personal computer monitors;
- Television receivers.

6.4 Flicker Test Results

Test Requirement: EN 61000-3-3

Test Method: EN 61000-3-3

Measurement Time: 10 mins

Limit: EN 61000-3-3 Clause 5

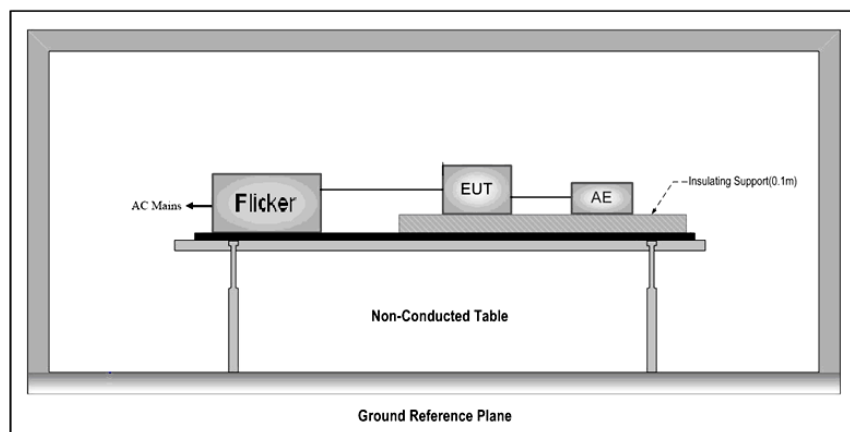
Operating Environment:

Ambient: Temp.: 24.0°C Humid.: 55% Press.: 1015mbar

Test Mode: Charging1, Charging2

Equipment Used: Refer to section 5 for details.

Test Setup:



Test result: PASS

Measurement Data:

Charging1:

Vrms at the end of test (Volt):	230.06		
T-max (mS):	0	Test limit (mS):	500.0 Pass
Highest dc (%):	0.00	Test limit (%):	3.30 Pass
Highest dmax (%):	0.00	Test limit (%):	4.00 Pass
Highest Pst (10 min. period):	0.064	Test limit:	1.000 Pass
Highest Plt (2 hr. period):	0.028	Test limit:	0.650 Pass

Charging2:

Vrms at the end of test (Volt):	230.28		
T-max (mS):	0	Test limit (mS):	500.0 Pass
Highest dc (%):	0.00	Test limit (%):	3.30 Pass
Highest dmax (%):	0.00	Test limit (%):	4.00 Pass
Highest Pst (10 min. period):	0.064	Test limit:	1.000 Pass
Highest Plt (2 hr. period):	0.028	Test limit:	0.650 Pass

7 Immunity Test Results

Performance Criteria Description in Clause 8 of EN 55035

Criterion A:	<p>The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function or change of operation state is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.</p> <p>During the test application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test.</p>
Criterion B:	<p>After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance.</p> <p>If the minimum performance level (or the permissible performance loss), or recovery time, is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.</p>
Criterion C:	<p>Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A reboot or re-start operation is allowed.</p> <p>Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</p>

7.1 Radiated Immunity

Test Requirement: EN 55035

Test Method: EN 61000-4-3

EUT Operation:

Ambient: Temp.: 24°C Humid.:56% Press.: 1015 mbar

Power AC 230V, 50Hz and AC110V, 60Hz

Test Mode: Charging1, Charging2

Criterion Required: A

Equipment Used: Refer to section 5 for details.

Test Setup:

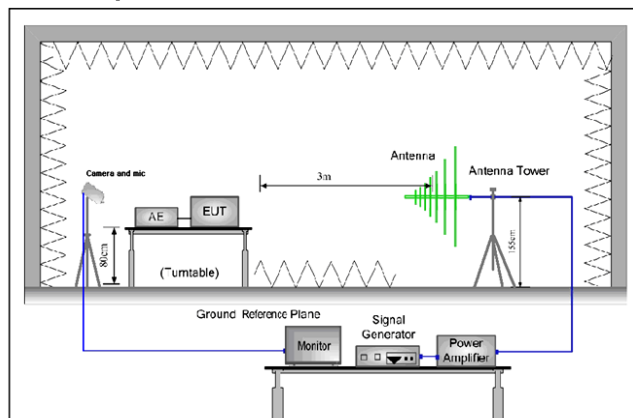


Figure 1. 80MHz to 1GHz

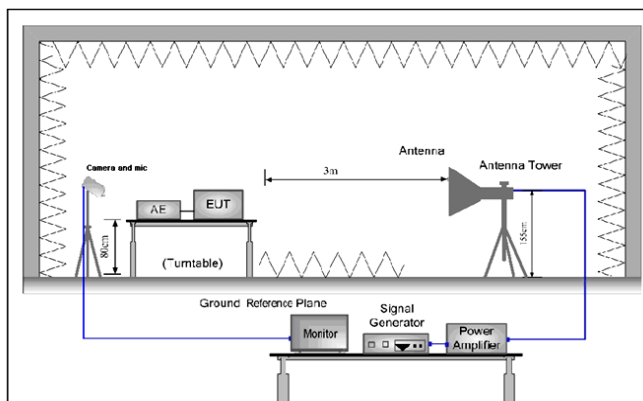


Figure 2. 1GHz to 6GHz

Test Procedure:

- 1) For table-top equipment, the EUT was placed in the chamber on a non-conductive table 0.8m high. For arrangement of floor-standing equipment, the EUT was mounted on a non-conductive support 0.1m above the supporting plane. For human body-mounted equipment, the EUT may be tested in the same manner as table top items.
- 2) If possible, a minimum of 1 m of cable is exposed to the electromagnetic field. Excess length of cables interconnecting units of the EUT shall be bundled low-inductively in the approximate center of the cable to form a bundle 30 cm to 40 cm in length.
- 3) The EUT was initially placed with one face coincident with the calibration plane. The EUT face being illuminated was contained within the UFA (Uniform Field Area).
- 4) The frequency ranges to be considered were swept with the signal modulated and pausing to adjust the RF signal level or to switch oscillators and antennas as necessary. Where the frequency range was swept incrementally, the step size was not exceed 1 % of the preceding frequency value.
- 5) The dwell time of the amplitude modulated carrier at each frequency was not be less than the time necessary for the EUT to be exercised and to respond, and was not less than 0.5 s.
- 6) The test normally was performed with the generating antenna facing each side of the EUT.
- 7) The polarization of the field generated by each antenna necessitates testing each selected side twice, once with the antenna positioned vertically and again with the antenna positioned horizontally.
- 8) The EUT was performed in a configuration to actual installation conditions, a video camera and/or an audio monitor were used to monitor the performance of the EUT.

Test result: PASS

Test result:

Frequency	Level	Modulation	EUT Face	Antenna Polaxis	Result / Observations
80MHz-1GHz, 1800MHz 2600MHz 3500MHz 5000MHz	3V/m	1kHz, 80% Amp. Mod, 1% increment Dwell time: 3 seconds	Front	V	A
				H	A
			Back	V	A
				H	A
			Left	V	A
				H	A
			Right	V	A
				H	A
			Top	V	A
				H	A
			Under	V	A
				H	A

Remarks:

A: No performance degradation during test.

7.2 ESD

Test Requirement:

EN 55035

Test Method:

EN 61000-4-2

EUT Operation:

Ambient:

Temp.: 23.3°C

Humid.:55%

Press.: 1015mbar

Test Mode:

Charging1, Charging2

Power

AC 230V, 50Hz and AC110V, 60Hz

Discharge Impedance:

330 Ω / 150 pF

Polarity:

Positive & Negative

Number of Discharge:

Minimum 10 times at each test point

Discharge Mode:

Single Discharge

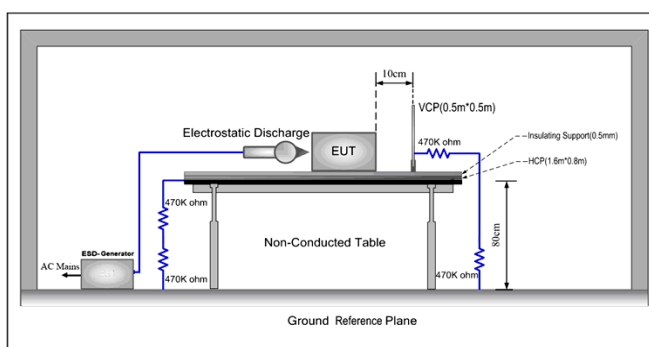
Discharge Period:

1 second minimum

Equipment Used:

Refer to section 5 for details.

Test Setup:



Test set-up for tabletop equipment

Test Procedure:

- 1) Contact discharges to the conductive surfaces and to coupling planes:
The EUT was exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points (a minimum of 50 discharges at each point). One of the test points was subjected to at least 50 indirect discharges (contact) to the centre of the front edge of the horizontal coupling plane. The remaining three test points shall each receive at least 50 direct contact discharges. If no direct contact test points were available, then at least 200 indirect discharges were applied in the indirect mode. Tests were performed at a maximum repetition rate of one discharge per second.
Air discharge at slots and apertures, and insulating surfaces:
On those parts of the EUT where it was not possible to perform contact discharge testing, the equipment was investigated to identify user accessible points where breakdown may occur. This investigation was restricted to those areas normally handled by the user. A minimum of 10 single air discharges were applied to the selected test point for each such area.
The application of electrostatic discharges to the contacts of open connectors was not required by this standard.
- 2) The EUT was put on a 0.8m high wooden table for table-top equipment or 0.1m high for floor standing equipment standing on the ground reference plane (GRP).
- 3) A horizontal coupling plane (HCP) 1.6m by 0.8m in size was placed on the table, and the EUT with its cables were isolated from the HCP by an insulating support thick than 0.5mm. The VCP 0.5m by 0.5m in size & HCP were constructed from the same material type & thickness as that of the GRP, and connected to the GRP via a 470k Ω resistor at each end. The distance between EUT and any of the other metallic surfaces accepted the GRP, HCP and VCP was greater than 1m.
- 4) During the contact discharges, the tip of the discharge electrode was touch the

EUT before the discharge switch is operated. During the air discharges, the round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT.

- 5) After each discharge, the ESD generator was removed from the EUT, the generator was then retriggered for a new single discharge. For ungrounded product, a discharge cable with two resistances was used after each discharge to remove remnant electrostatic voltage. 10 times of each polarity single discharge were applied to HCP and VCP.

Test result: PASS

Test data:

Observations:

Test Point:

1. All insulated enclosure and seams.
2. All accessible metal parts of the enclosure.

Direct Application Test Results				
Direct Application			Test Results	
Discharge Level (kV)	Pulse No.	Test Point	Contact Discharge	Air Discharge
± 8	10 for every level	1	N/A	A
± 4	10 for every level	2	A	N/A
Indirect Application for tabletop equipment Test Results				
Indirect Application			Test Results	
Discharge Level (kV)	Pulse No.		Horizontal Coupling	Vertical Coupling
± 4	10 for every level		A	A

Remark:

A: No performance degradation during test.

N/A: Not applicable

7.3 RF Common Mode 0.15MHz to 80MHz

Test Requirement: EN 55035

Test Method: EN 61000-4-6

Test level: 3V rms

Modulation: 80%, 1kHz Amplitude Modulation

Test port: AC port.

Criterion Required: A

EUT Operation:

Ambient: Temp.: 24.0°C

Humid.: 55%

Press.: 1015 mbar

Power: AC 230V, 50Hz and AC110V, 60Hz

Test Mode: Charging1, Charging2

Equipment Used: Refer to section 5 for details.

Test Setup:

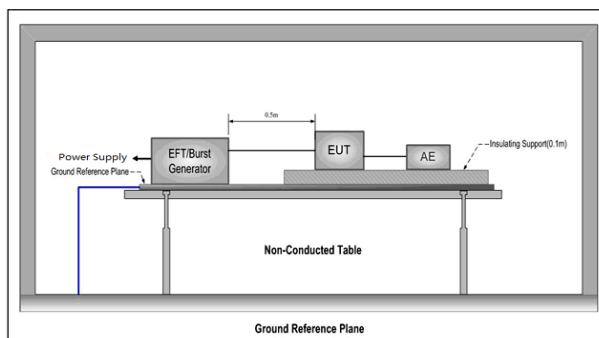


Figure 1. For AC port

Test Procedure:

- 1) The EUT was placed on an insulating support of 0.1m height above a ground reference Plane, arranged and connected to satisfy its functional requirement. All cables exiting the EUT was supported at a height of at least 30 mm above the ground reference plane.
- 2) The coupling and decoupling devices were required; they were located between 0.1 m and 0.3 m from the EUT. This distance was to be measured horizontally from the projection of the EUT on to the ground reference plane to the coupling and decoupling device.
- 3) Each AE, used with clamp injection, shall be placed on an insulating support 0.1 m above the ground reference plane. A decoupling network shall be installed on each cable between the EUT and AE except the cable under test. All cables connected to each AE, other than those being connected to the EUT, shall be provided with decoupling networks. The decoupling networks connected to each AE (except those on cables between the EUT and AE) shall be applied no further than 0.3 m from the AE. The cable(s) between the AE and the decoupling network (s) or in between the AE and the injection clamp shall not be bundled nor wrapped and shall be kept between 30 mm and 50 mm above the ground reference plane
- 4) The frequency range was swept from 150 kHz to 80 MHz, using the signal levels established during the setting process, and with the disturbance signal 80 % amplitude modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or to change coupling devices as necessary. Where the frequency was swept incrementally, the step size does not exceed 1 % of the preceding frequency value. The dwell time of the amplitude modulated carrier at each frequency was not less than the time necessary for the EUT to be exercised and to respond, and was not less than 0.5 s.

Test result:

PASS

Test data:

Frequency	Line	Test Level	Modulation	Step Size	Dwell Time	Observation (Performance Criterion)
150kHz to 10MHz	AC port (2 Line)	3Vrms	80%, 1kHz Amp. Mod.	1%	2 S	A
10MHz to 30MHz		3 to 1Vrms	80%, 1kHz Amp. Mod.	1%	2 S	A
30MHz to 80MHz		1Vrms	80%, 1kHz Amp. Mod.	1%	2 S	A

Remark:

A: No performance degradation during test.

7.4 Electrical Fast Transients (EFT)

Test Requirement:	EN 55035	
Test Method:	EN 61000-4-4	
Test Level:	± 1.0kV 5/50 ns 5 kHz on AC port.	
Polarity:	Positive & Negative	
Criterion Required:	A	
Repetition Frequency:	5kHz (For CPE xDSL ports repetition frequency is 100kHz)	
Burst Period:	300ms	
Test Duration:	2 minute per level & polarity	
EUT Operation:		
Ambient:	Temp.: 24.0°C	Humid.:55%
Power	AC 230V, 50Hz and AC110V, 60Hz	
Test Mode:	Charging1, Charging2	
Equipment Used:	Refer to section 5 for details.	
Test Setup:		

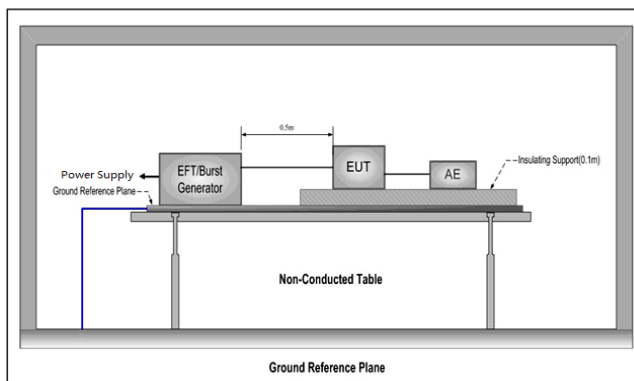


Figure 1. For AC port

Test Procedure:

- 1) The EUT was placed on a ground reference plane (GRP) insulated by an insulating support 0.1 m thick and the GRP was placed on a 0.8m high wooden table for table-top equipment. For floor standing equipment, the EUT was placed on a 0.1m high wooden support above the GRP.
- 2) The GRP shall project beyond the EUT and the clamp by at least 0.1m on all sides. The distance between the EUT and any other of the metallic surface except the GRP was greater than 0.5m. All cables to the EUT was placed on the insulation support 0.1m above GRP. A cable not subject to EFT was routed as far as possible from cable under test to minimize the coupling between the cables.
- 3) The length of signal and power cable between the EUT and EFT generator was 0.5m. If the cable is a non-detachable supply cable more than 0.5m, the excess length of this cable shall be folded to avoid a flat coil and situated at a distance of 0.1m above the GRP.
- 4) The EUT was conducted the below specified test voltages for line and neutral or line, neutral and earth simultaneously (for telecommunication, single, control and DC port line with capacitive coupling clamp), 120 seconds duration. If the equipment contains identical ports, only one was tested; multicomputer cables, such as a 50-pair telecommunication cable, were tested as a single cable. Cables did not be split or divided into groups of conductors for this test; interface ports, which were intended by the manufacturer to be connected to data cables not longer than 3 m, did not be tested.

Test result: PASS

Test data:

Lead under Test	Level (kV)	Coupling Direct/Clamp	Observations (Performance Criterion)
Live	± 1.0	Direct	A
Neutral	± 1.0	Direct	A
Live, Neutral	± 1.0	Direct	A

Remark:

A: No performance degradation during test.

7.5 Surge

Test Requirement: EN 55035

Test Method: EN 61000-4-5

Test Level: For AC port

- 1) 1kV 1.2/50(8/20) μ s Live to Neutral
- 2) 2kV 1.2/50(8/20) μ s Live, Neutral to Earth

Criterion Required: for AC mains power ports: B

Polarity: Positive & Negative

Interval: 60s between each surge

EUT Operation:

Ambient: Temp.: 24.0°C Humid.:55% Press.: 1015 mbar

Power AC 230V, 50Hz and AC110V, 60Hz

Test Mode: Charging1, Charging2

Equipment Used: Refer to section 5 for details.

Test Setup:

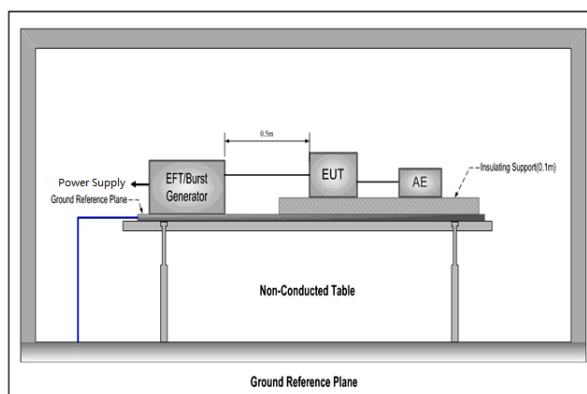


Figure 1. For AC port

- Test Procedure:**
- 1) The EUT was placed on a ground reference plane (GRP) insulated by an insulating support 0.1 m thick and the GRP was placed on a 0.8m high wooden table for table-top equipment. For floor standing equipment, the EUT was placed on a 0.1m high wooden support above the GRP.
 - 2) The 1.2/50 μ s surge was to be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks were required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines and to provide sufficient decoupling impedance to the surge wave so that the specified wave may be applied on the lines under test.
 - 3) The power cord between the EUT and the coupling/decoupling network was not exceed 2 m in length. The interconnection line between the EUT and the coupling/decoupling network shall not exceed 2 m in length.

The EUT was conducted 1 kV test voltage for line to line and line to neutral and conducted 2 kV test voltage for line to earth and neutral to earth, five positive pulses and five negative pulses each at 90° and 270° for a.c. power ports and five positive pulses and five negative surge pulses for d.c. power ports (for analogue/digital data ports (unshielded symmetrical) port, It was 1 kV and 4kV for cable longer than 3m line to ground, for analogue/digital data ports (coaxial or shielded), It was 0.5 kV for cable longer than 3m line to ground, five positive pulses and five negative surge pulses), for DC network power ports (outdoor cables, cable lengths greater than 3m), It was 0.5 kV for cable longer than 3m line to reference ground, The test levels were applied on the EUT with a 2 Ω generator source impedance for power supply terminals and 40 Ω output impedance for interconnection lines. The tests were done at repetition rate one per minute.,

Test Results: PASS

Test Data:

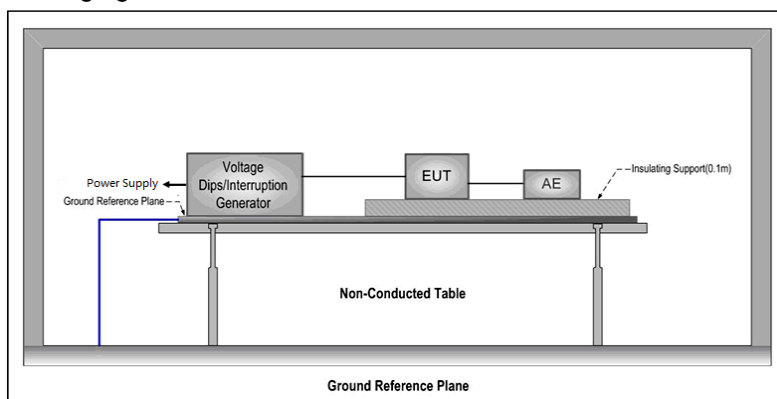
For AC port (2 line)					
Pulse No	Line-Line	Level (kV)	Surge interval	phase (deg)	Observation (Performance Criterion)
1-5	L-N	+1	60s	90°	A
6-10	L-N	-1	60s	270°	A

Remark:

A: No performance degradation during test.

7.6 Voltage Dips and Interruptions

Test Requirement:	EN 55035		
Test Method:	EN 61000-4-11		
	Voltage dip: >95% reduction voltage for 0.5 period; B		
Test Level:	Voltage dip: 30 % reduction voltage for 25 cycles,50Hz and 30 cycles,60Hz; C		
	Voltage interruption: >95% reduction voltage for 250 cycles,50Hz and 300 cycles,60Hz; C		
No. of Dips / Interruptions:	3 per Level		
EUT Operation:			
Ambient:	Temp.: 24.0°C	Humid.:55%	Press.: 1015 mbar
Power	AC 230V, 50Hz and AC110V, 60Hz		
Test Mode:	Charging1, Charging2		
Test Setup:			



Test Procedure:	<ol style="list-style-type: none">1) The EUT was placed on a ground reference plane (GRP) insulated by an insulating support 0.1 m thick and the GRP was placed on a 0.8m high wooden table for table-top equipment. For floor standing equipment, the EUT was placed on a 0.1m high wooden support above the GRP.2) The test was performed with the EUT connected to the test generator with the shortest power supply cable as specified by the EUT manufacturer.3) The EUT was tested for each selected combination of test level and duration with a sequence of three dips /interruptions with intervals of 10 s minimum. Each representative mode of operation was tested.4) For EUT with more than one power cord, each power cord was tested individually.
Equipment Used:	Refer to section 5 for details.
Test result:	PASS

Test data:

EUT operating mode	% U _T	Phase	Duration of dropout in Periods	No. of dropout	Time between dropout	Observations (Performance Criterion)
Above modes	0	0° & 90°&270°	0.5 cycles(50&60Hz)	3	10s	A
Above modes	70	0° & 90°&270°	25 cycles for 50Hz 30 cycles for 60Hz	3	10s	A
Above modes	0	0° & 90°&270°	250 cycles for 50Hz 300 cycles for 60 Hz	3	10s	C

Remark:

A: No performance degradation during test.

C: During the test, the EUT stop charging, after the test, it automatic recovery charging.

APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

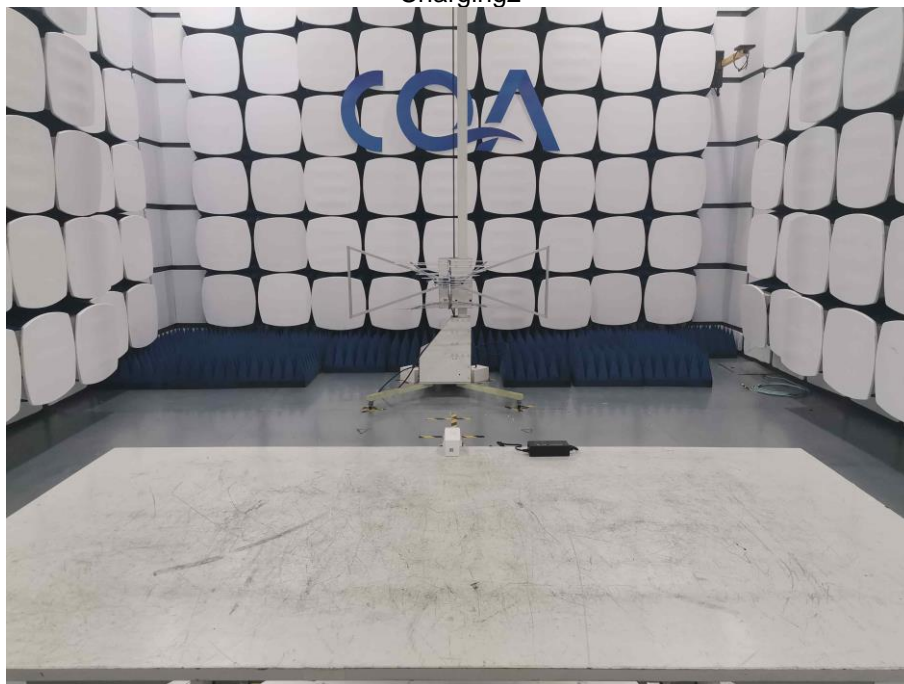
Test mode No.: ZINO 2

Radiated emission Test Setup (30MHz~1GHz)

Charging1



Charging2



Radiated emission Test Setup (Above 1GHz)

Charging1



Charging2

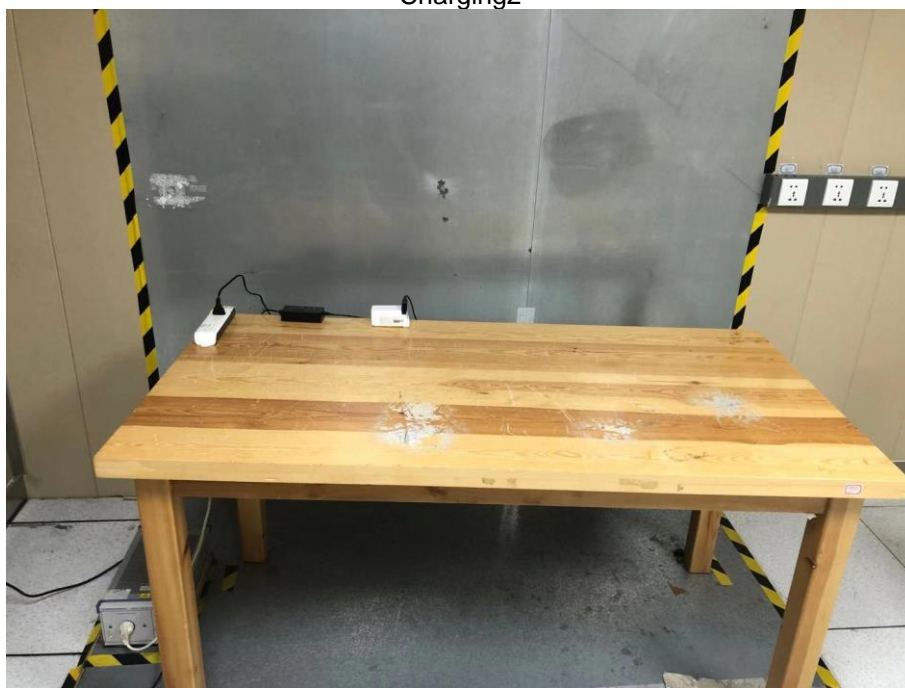


Conducted emission Test Setup

Charging1



Charging2



Voltage fluctuations and flicker Test Setup

Charging1



Charging2



Electrostatic discharge Test Setup

Charging1



Charging2



Voltage dips and interruptions, Surge and EFT for AC port Test Setup

Charging1

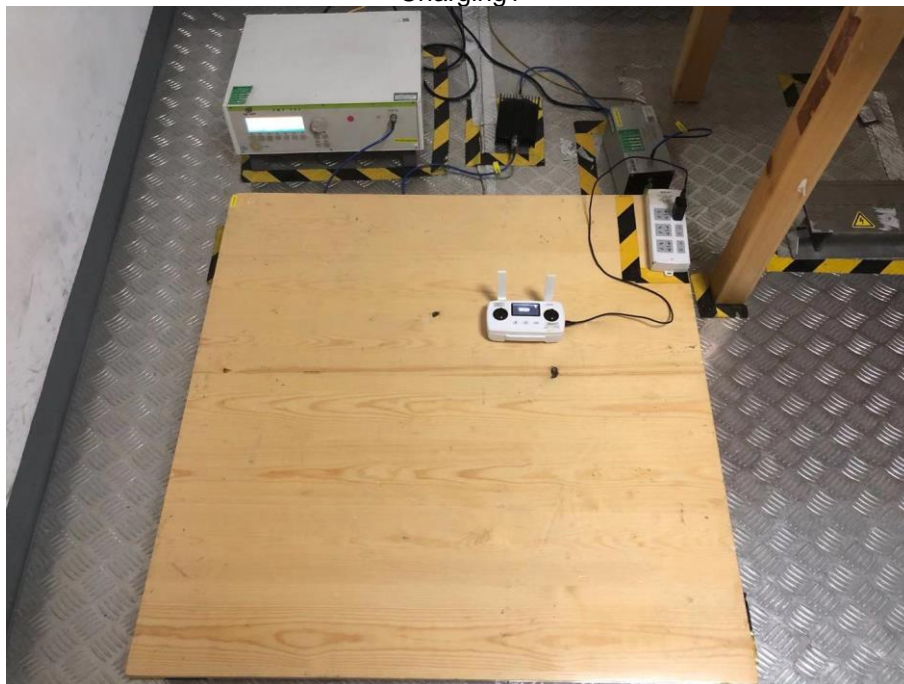


Charging2

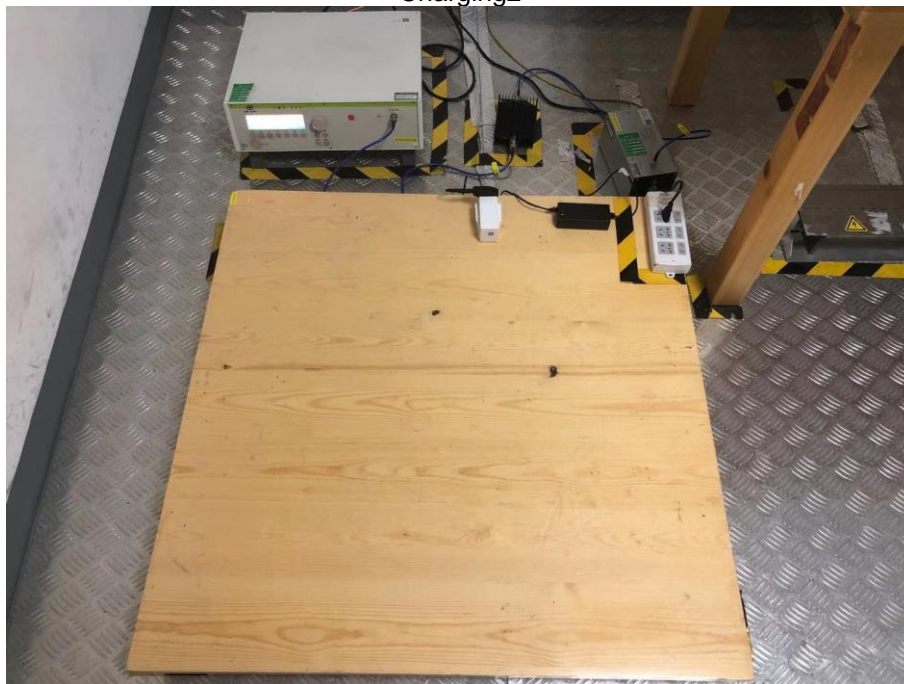


RF common mode Test Setup

Charging1



Charging2

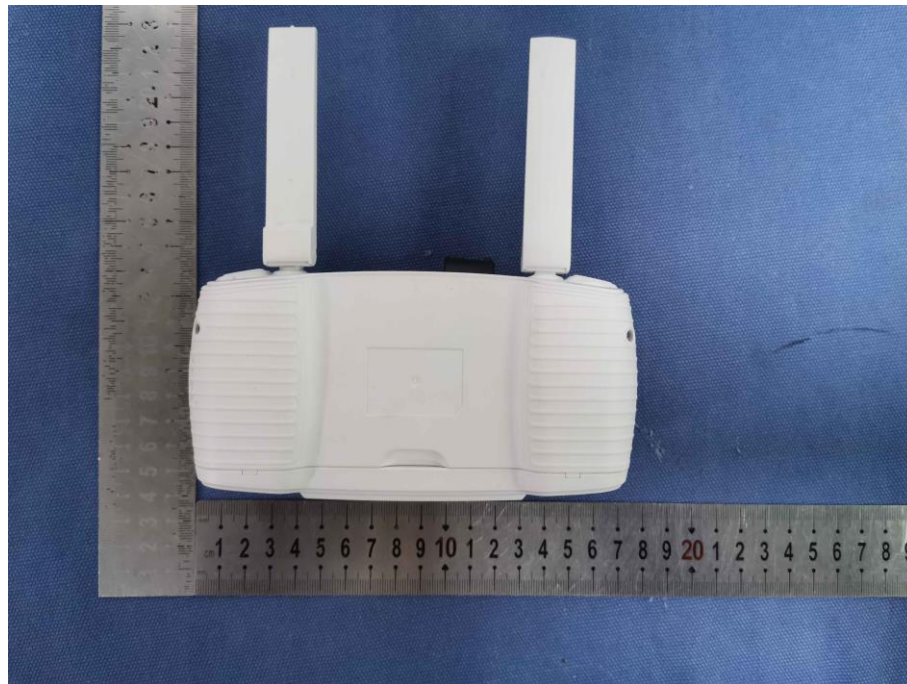


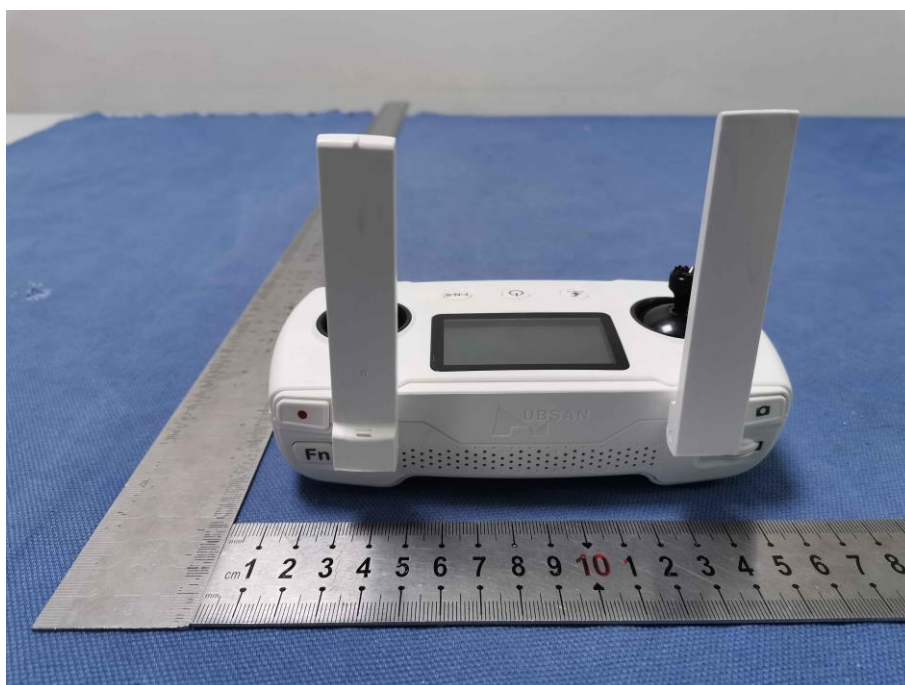
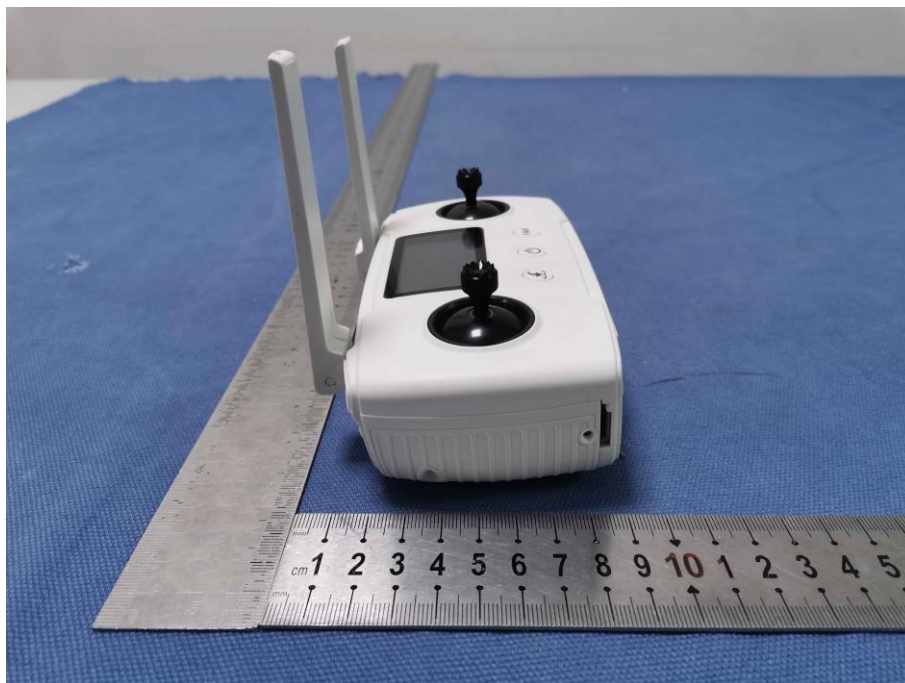
APPENDIX 2 PHOTOGRAPHS OF EUT

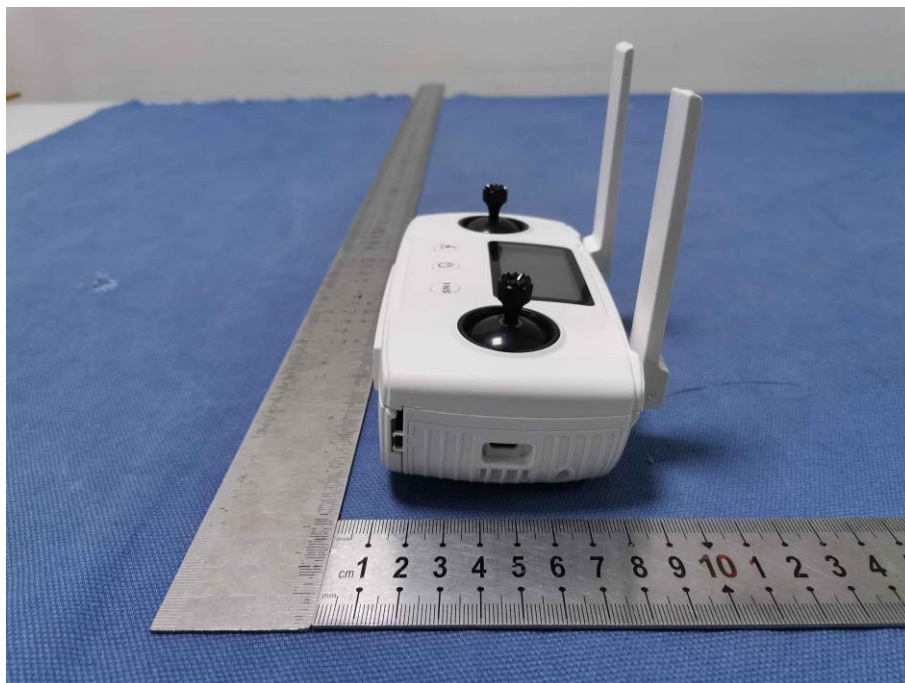
Test mode No.: ZINO 2

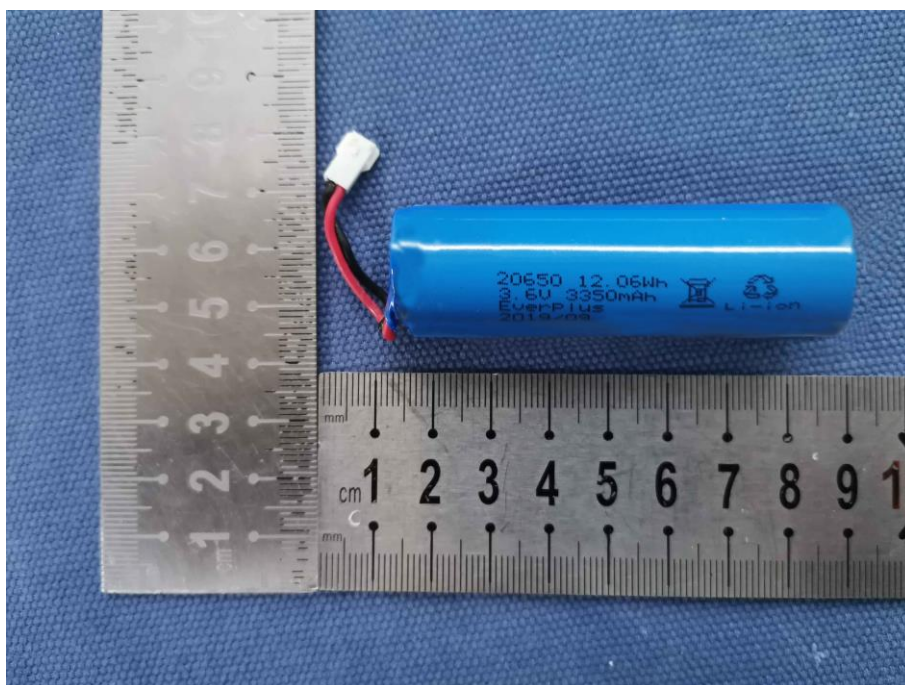
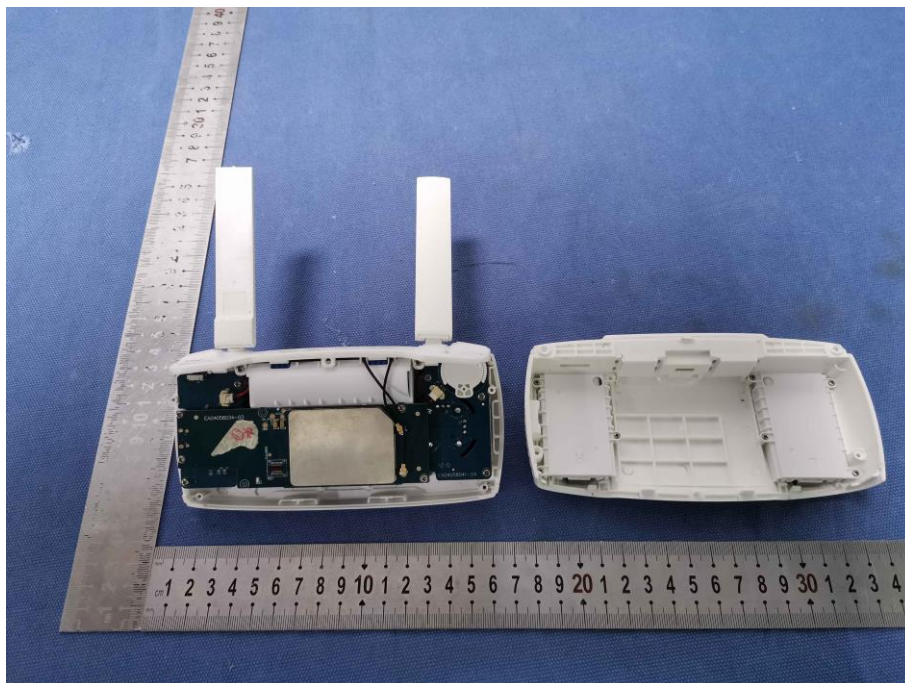
remote-control unit

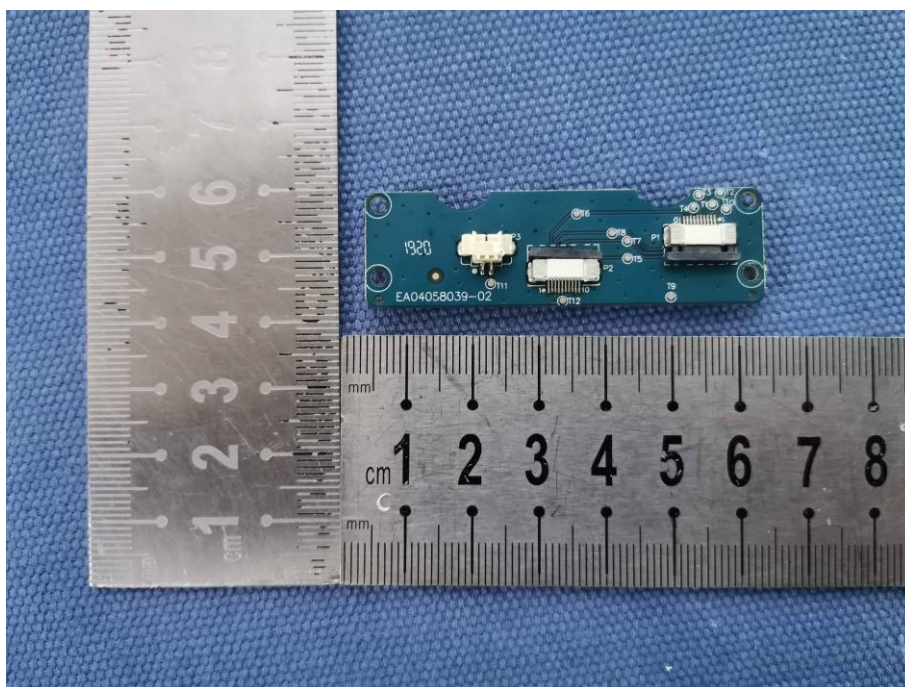
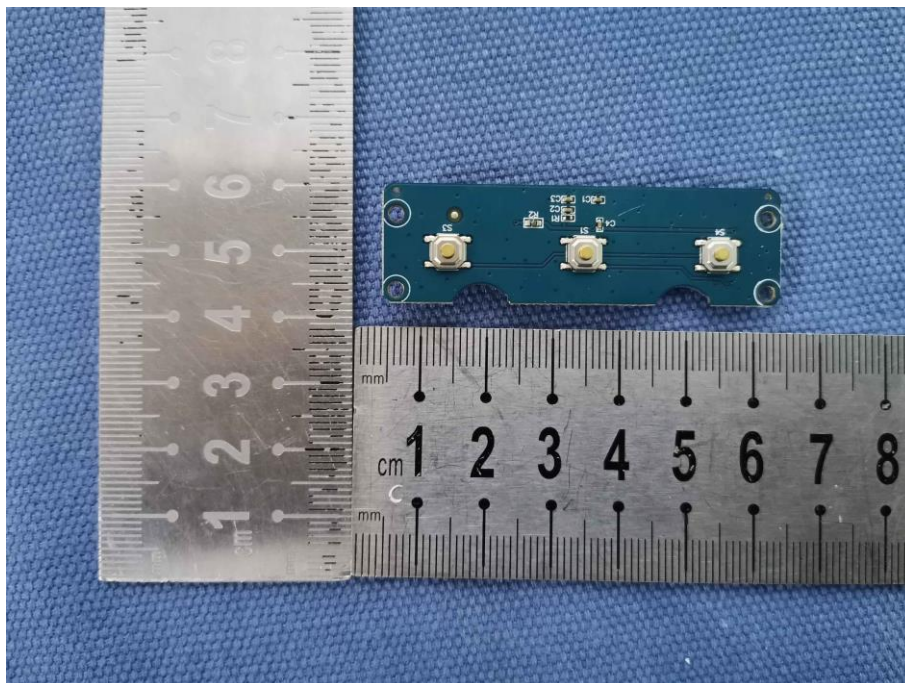


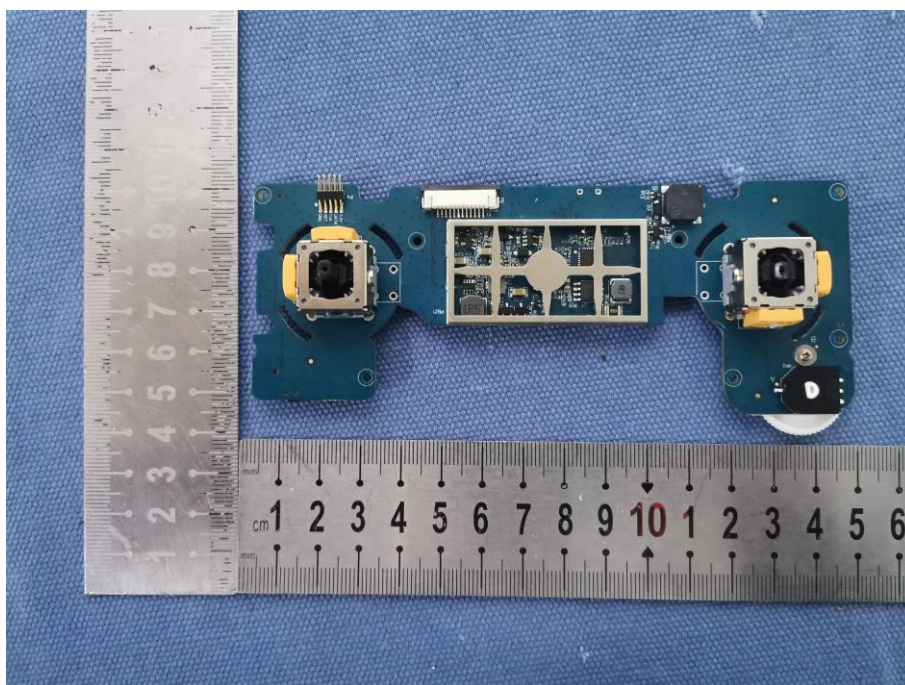
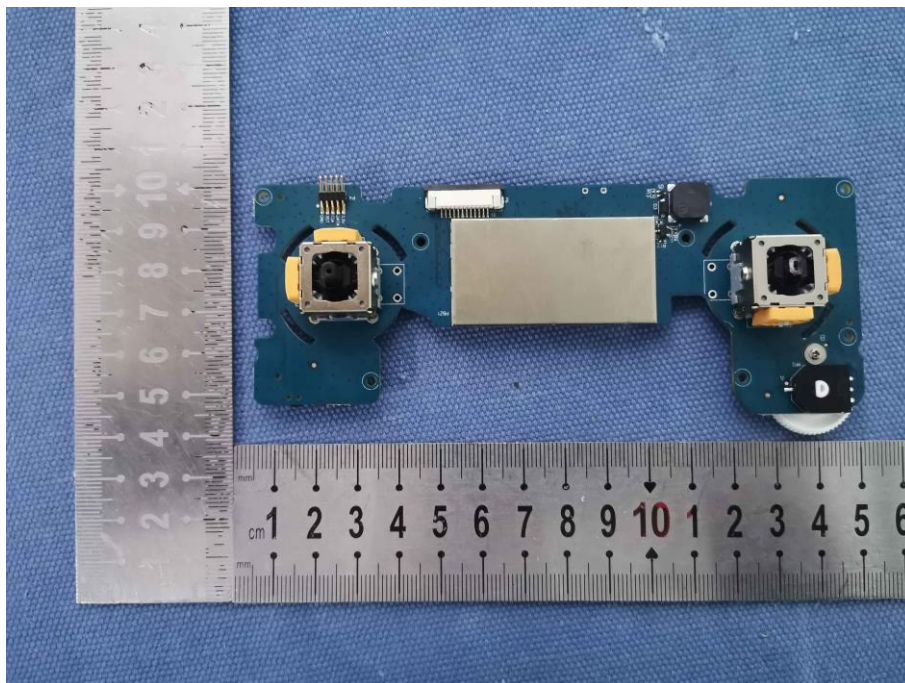


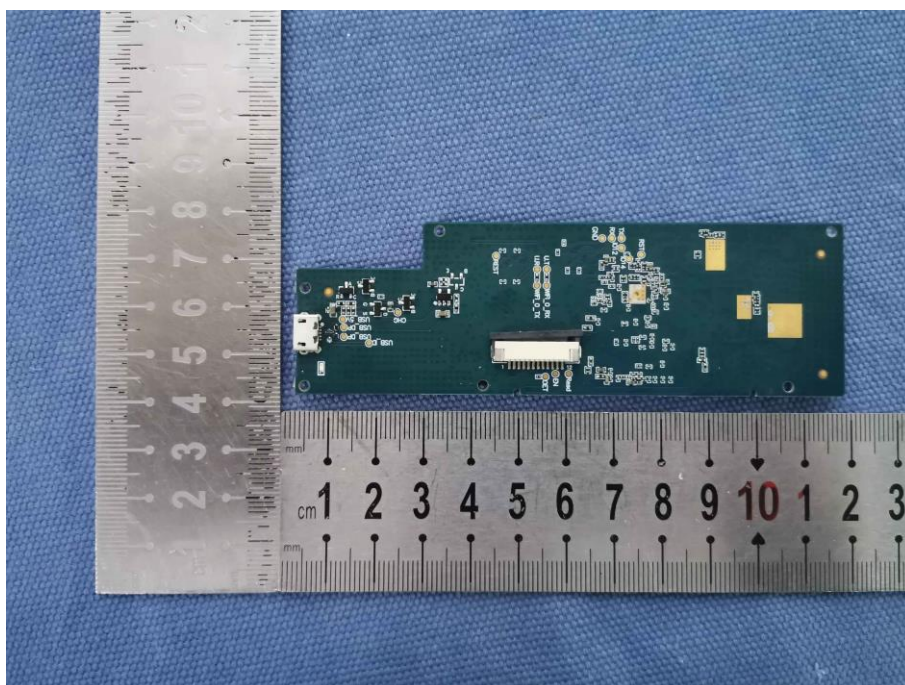
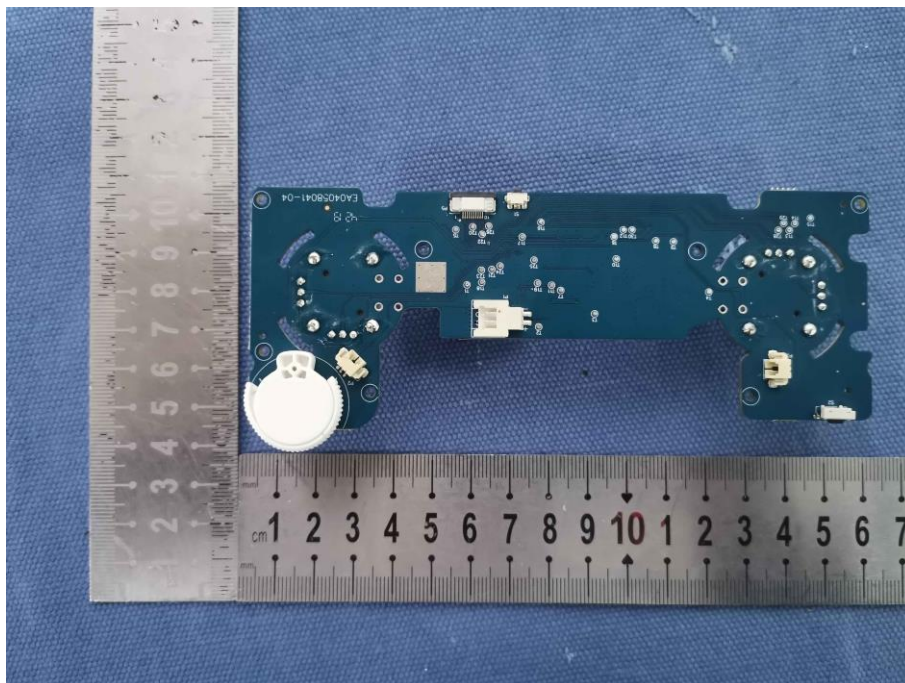


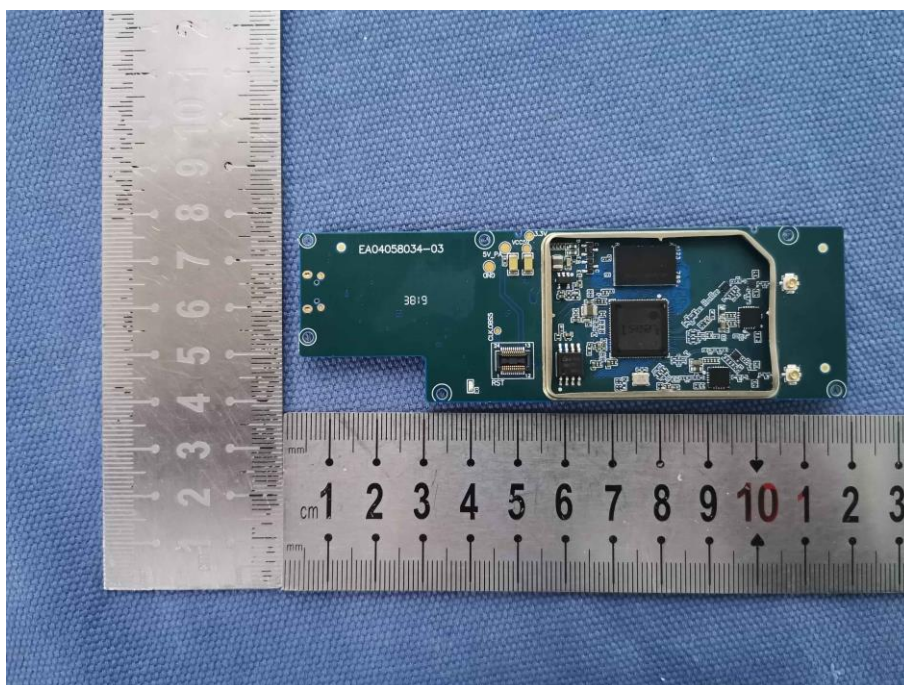
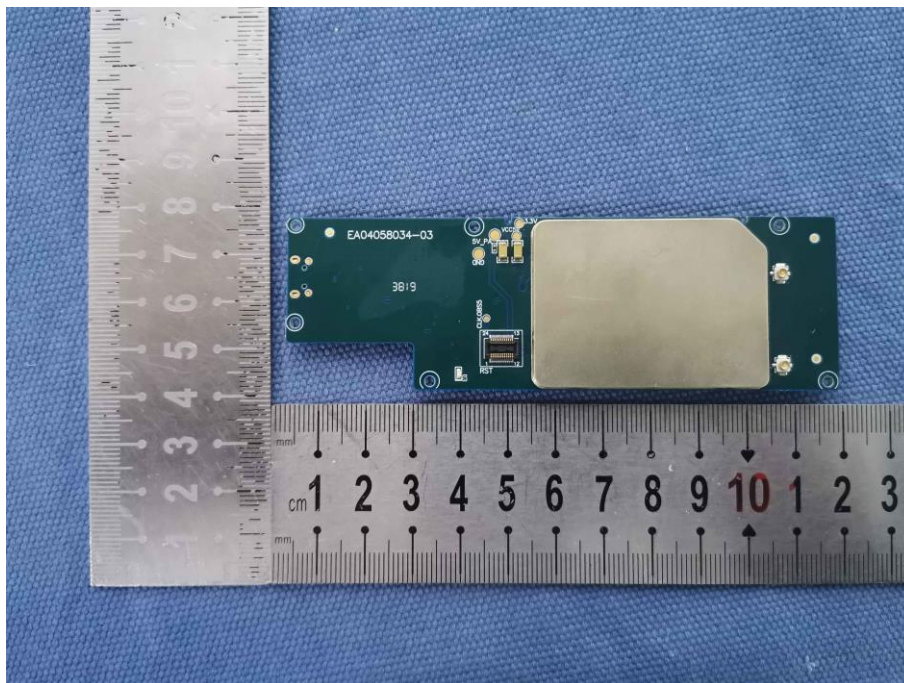


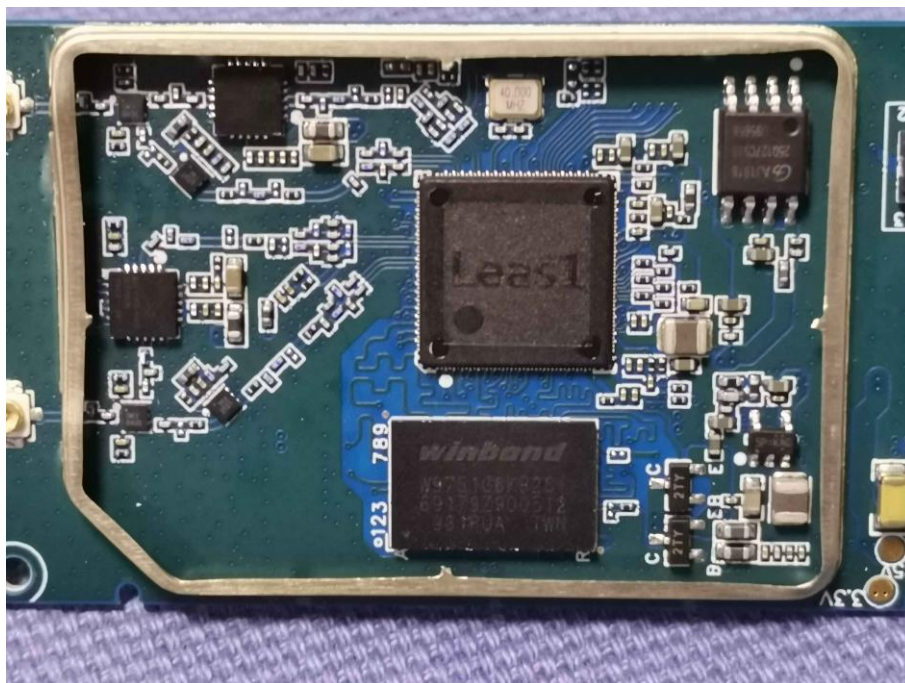








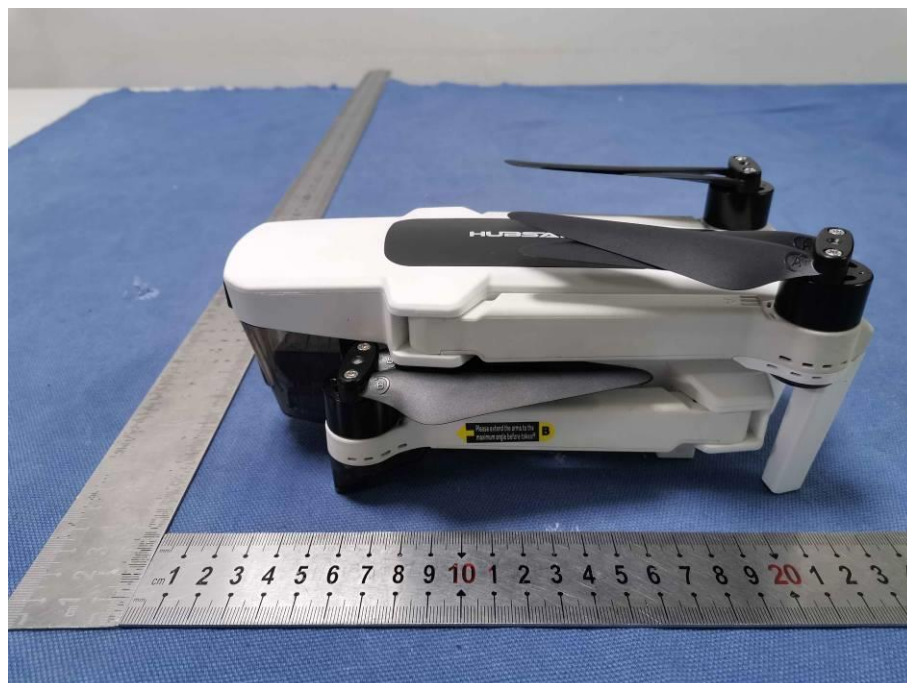
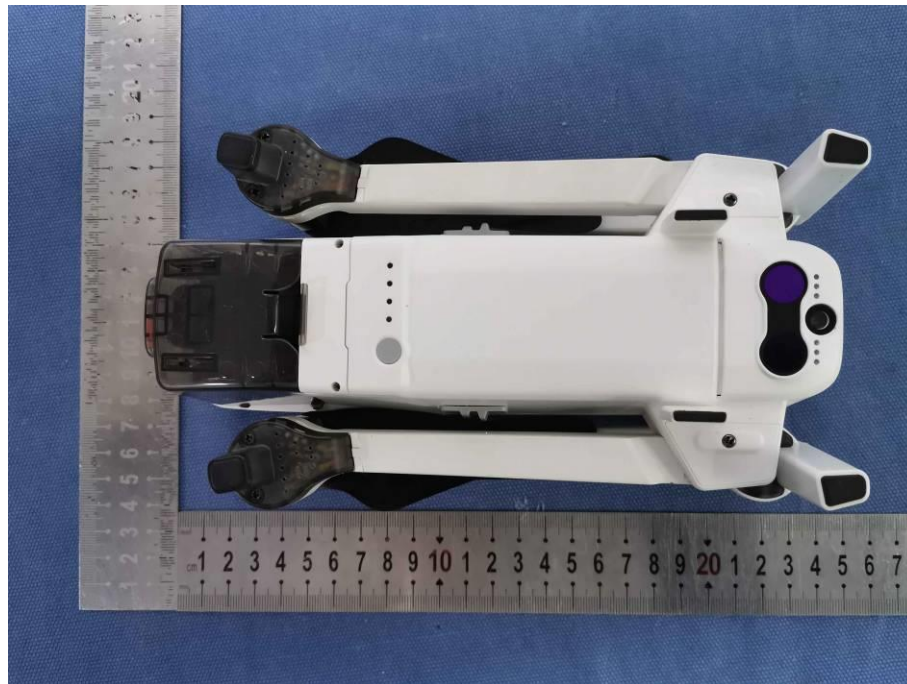


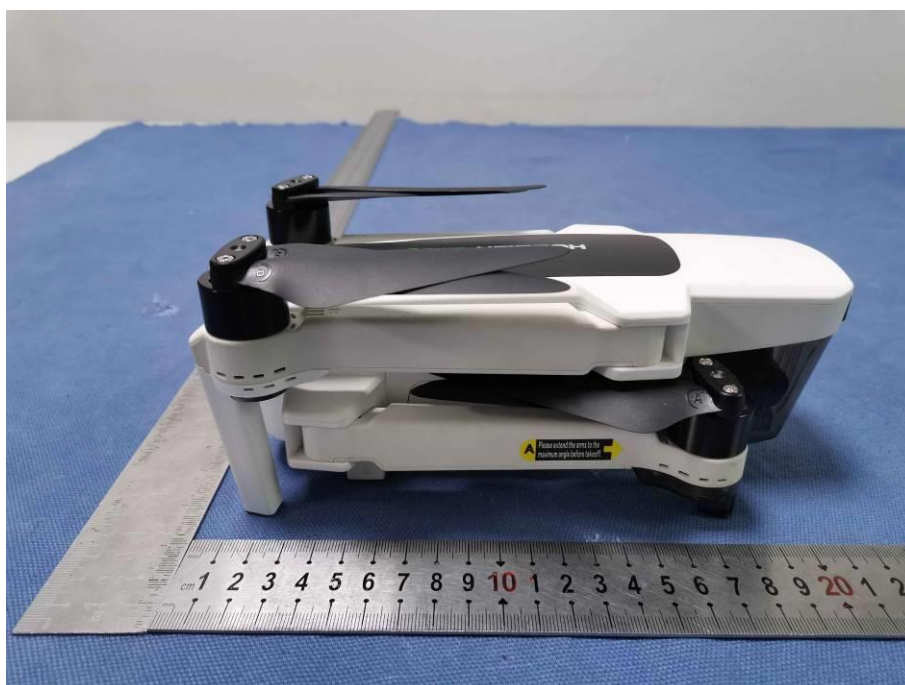
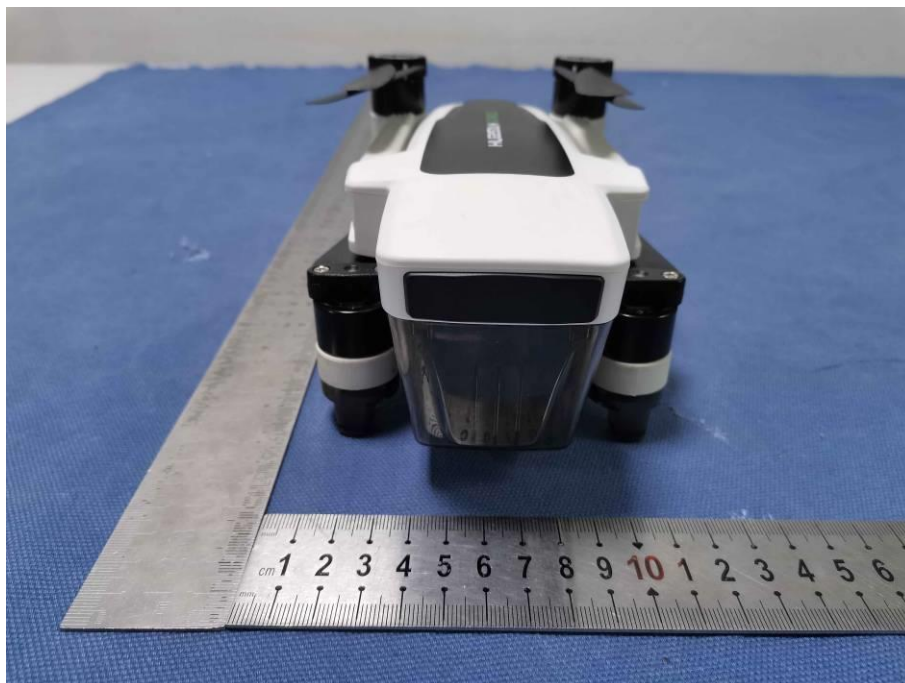


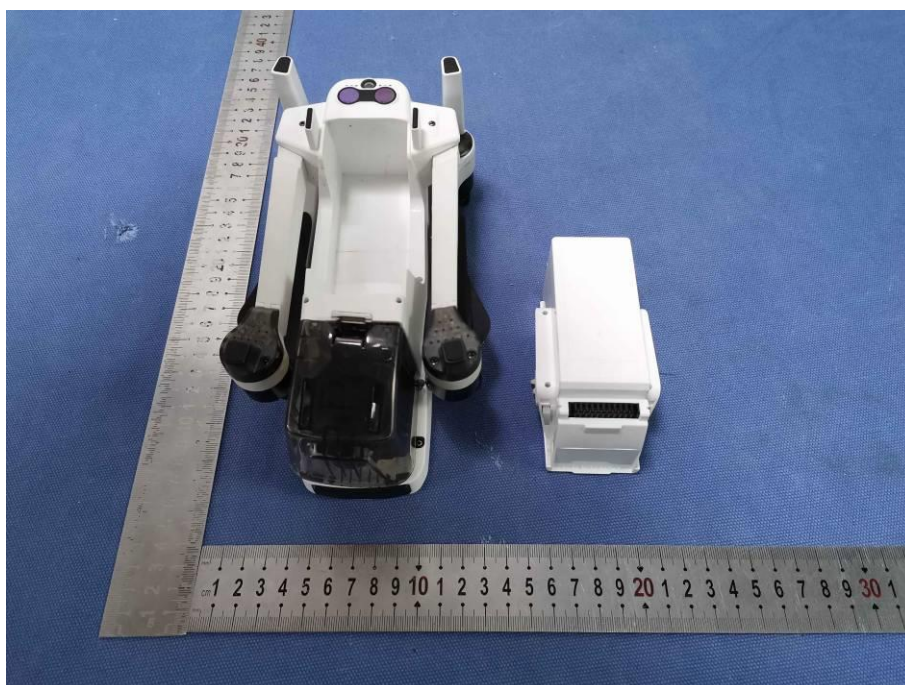
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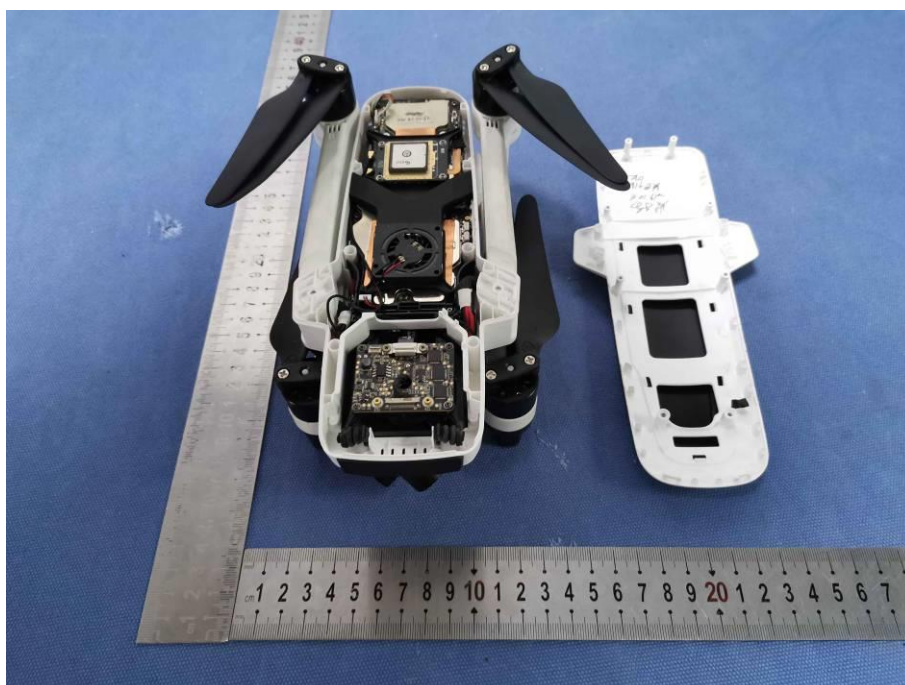


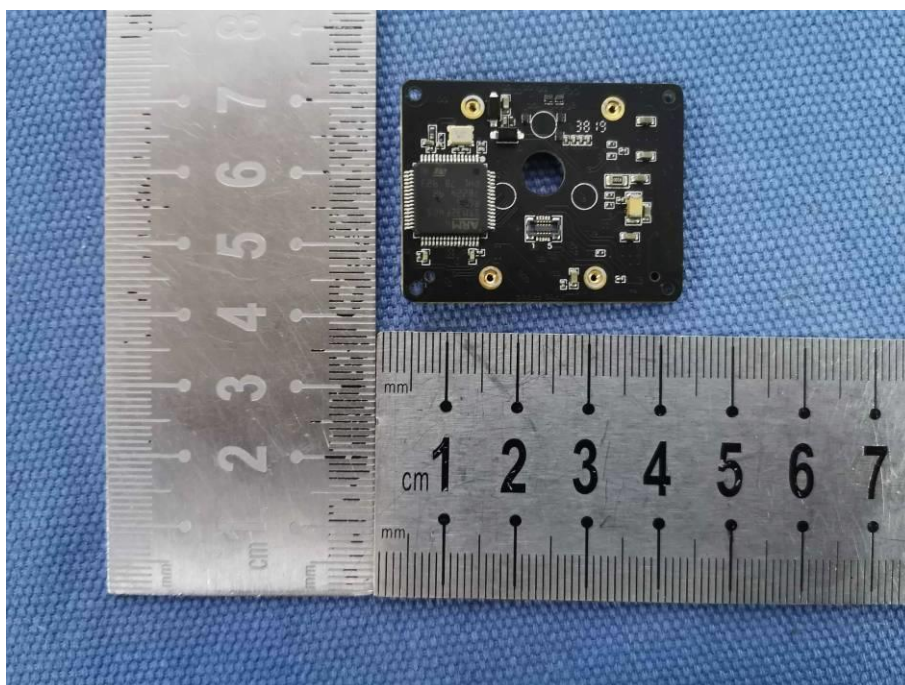
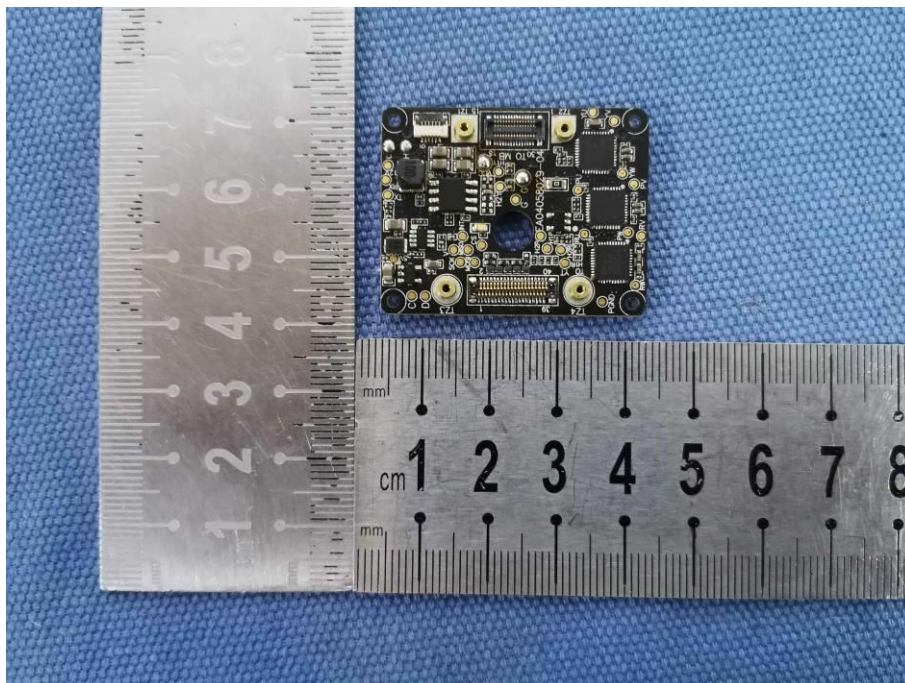


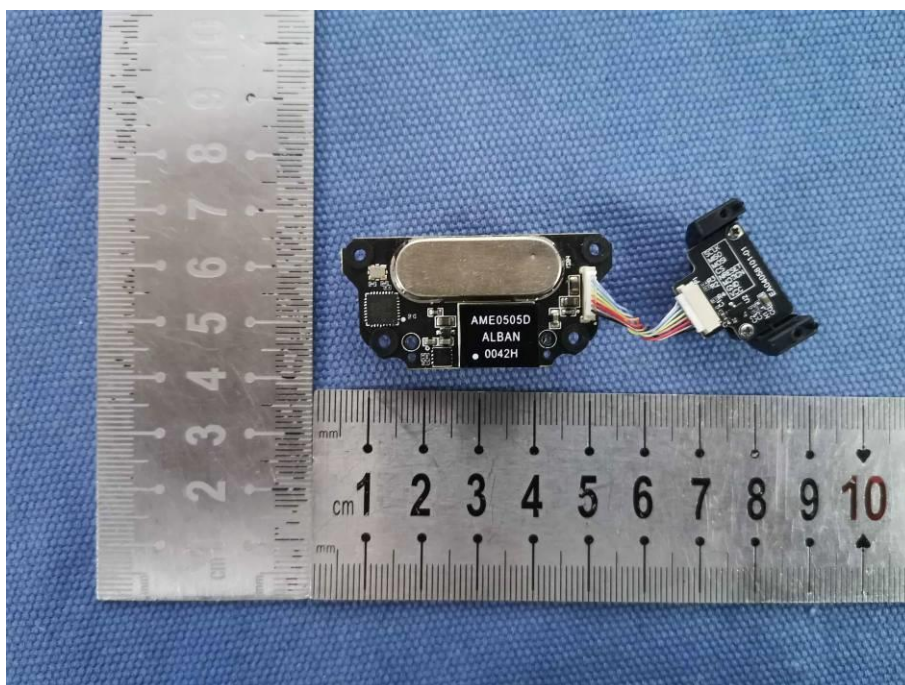
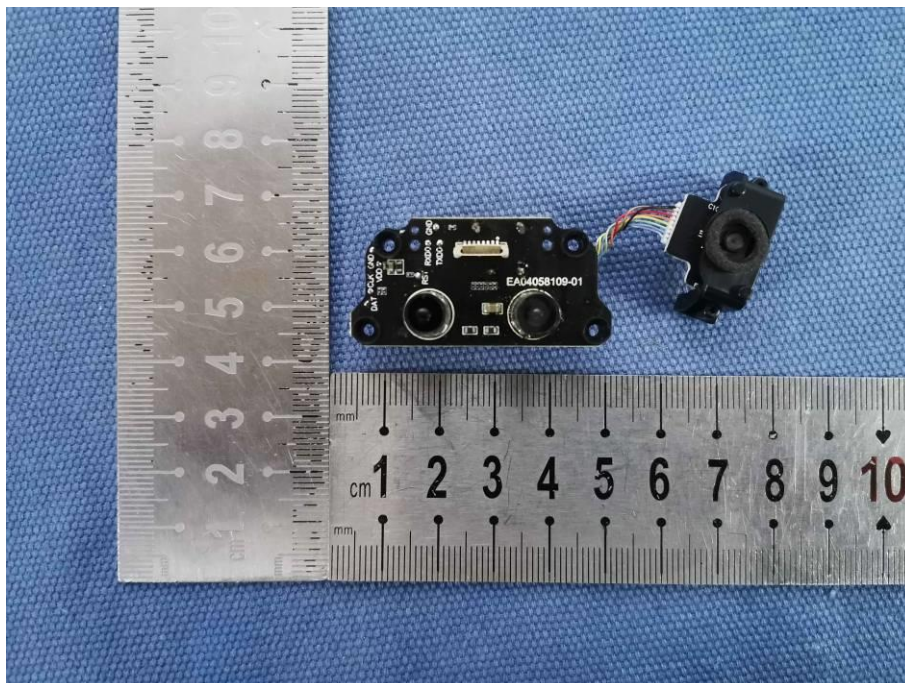


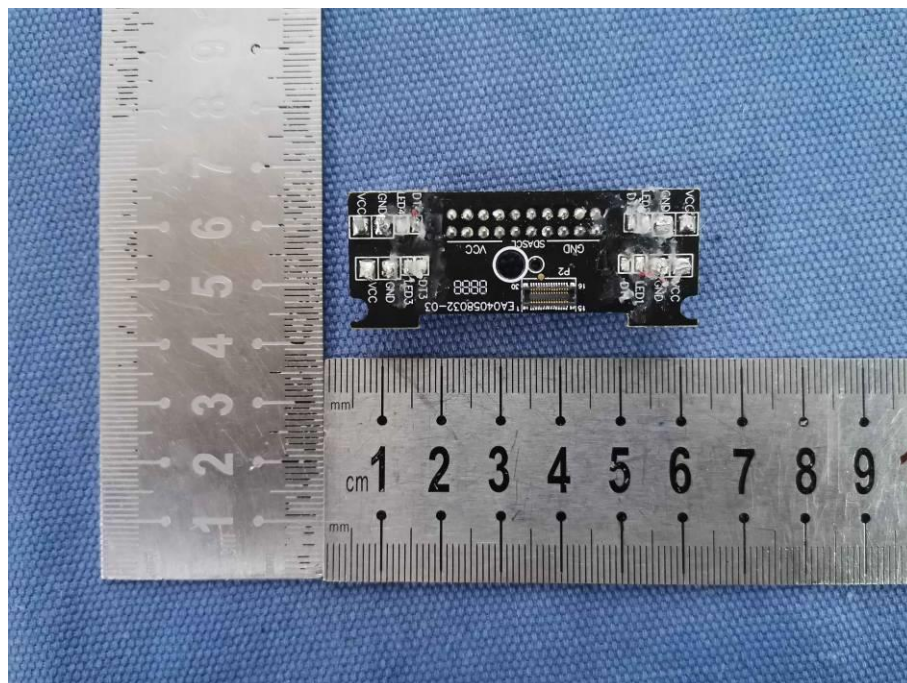
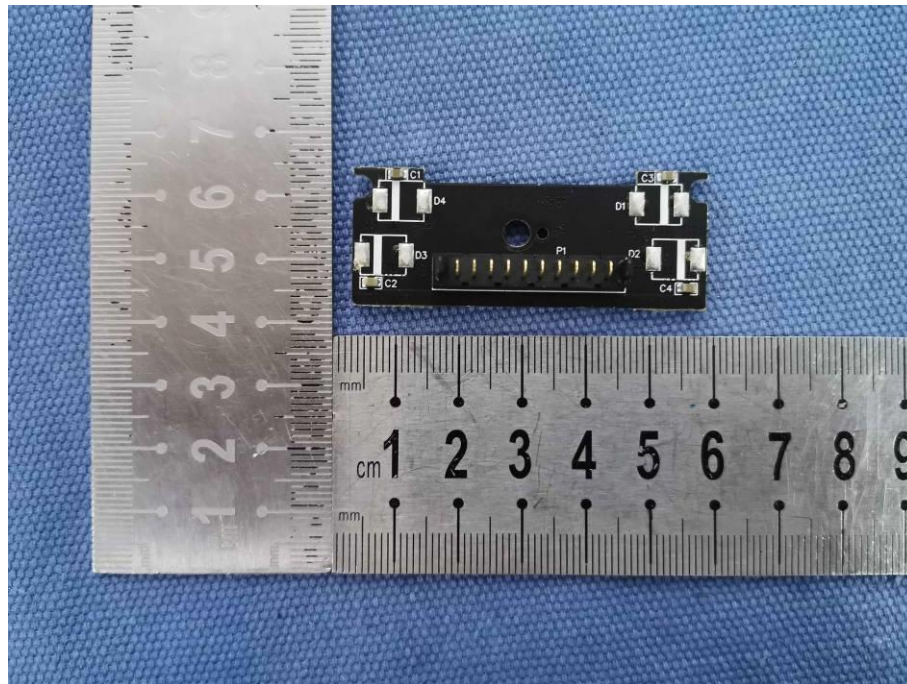


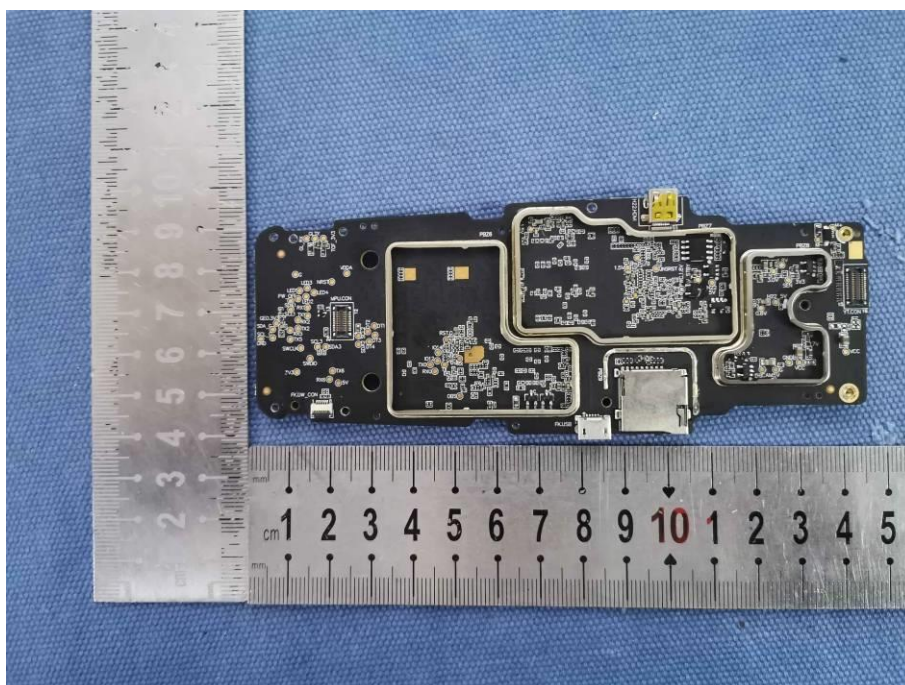
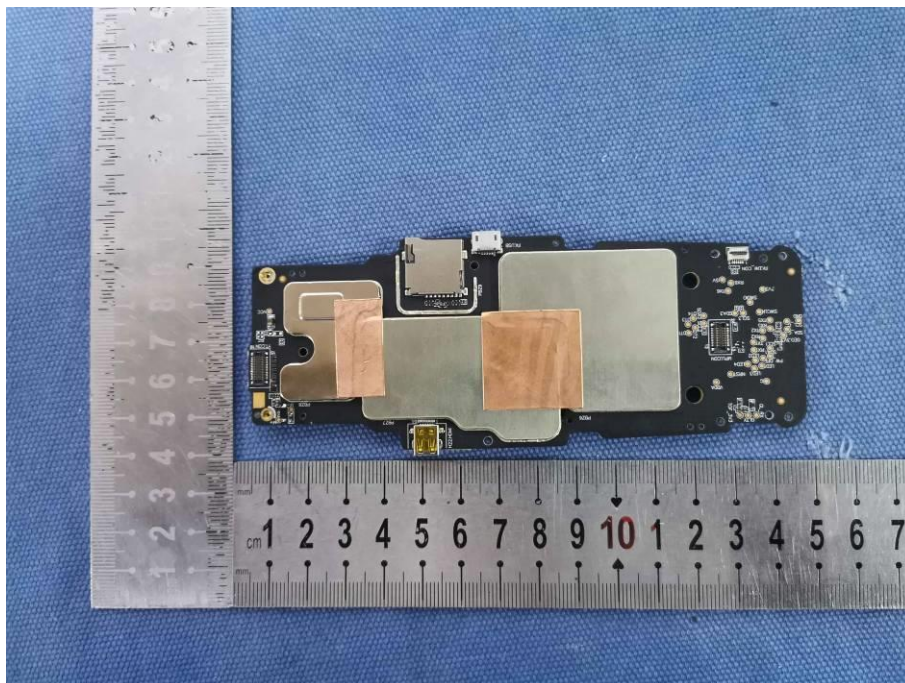


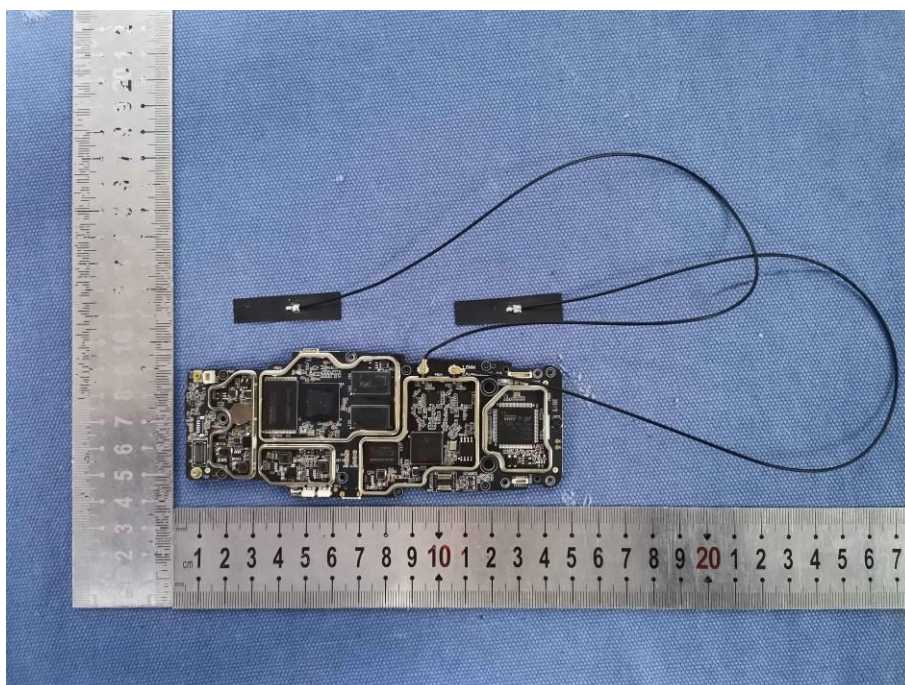
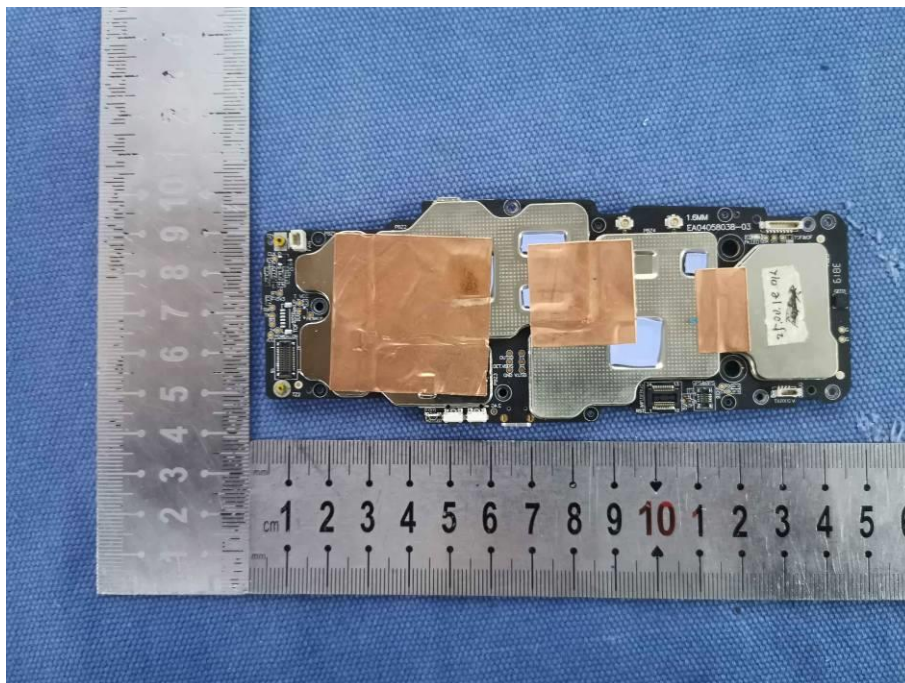


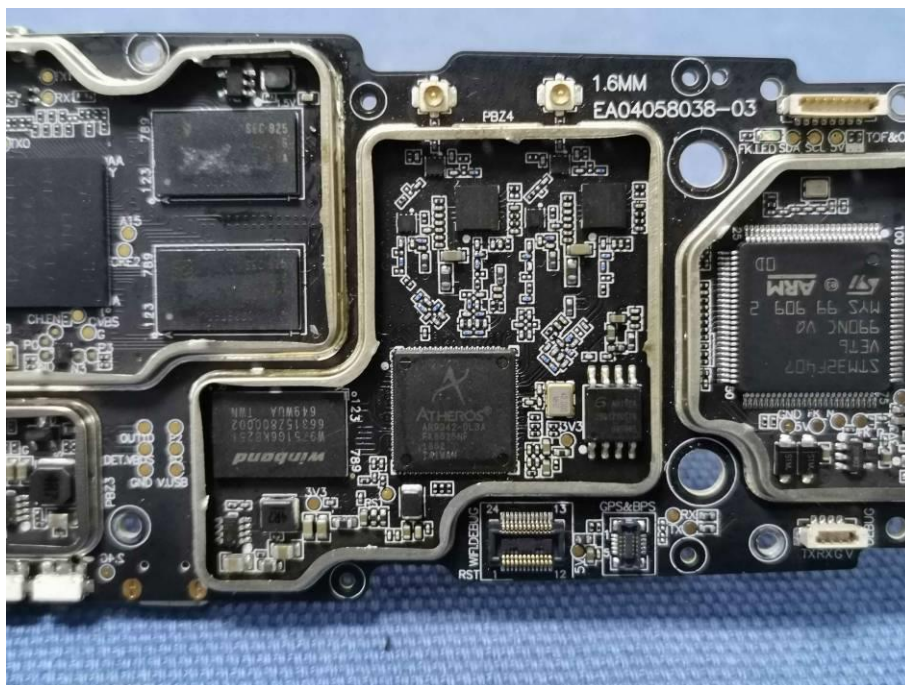












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