TEST REPORT

Product Name:	Ghost drone
Trademark:	apex
Model Number:	GD-65A AT-66
Prepared For:	Apex Drone（Shenzhen）Co.,Ltd
Address:	A.Floor 4,A001 Building, Zhi Ji Industrial Park, No.92 KuiChong Street, LongGang district, ShenZhen, China
Manufacturer:	Apex Drone（Shenzhen）Co.,Ltd
Address:	A.Floor 4,A001 Building, Zhi Ji Industrial Park, No.92 KuiChong Street, LongGang district, ShenZhen, China
Prepared By:	Shenzhen BCTC Testing Co., Ltd.
Address:	BCTC Building & 1-2F, East of B Building, Pengzhou Industrial, Fuyuan 1st Road, Qiaotou Community, Fuyong Street, Bao'an District, Shenzhen, China
Sample Received Date:	Aug. 21, 2018
Sample tested Date:	Aug. 23, 2018 to Aug. 30, 2018
Issue Date:	Aug. 30, 2018
Report No.:	BCTC-FY180804824-2E
Test Standards	ETSI EN 300 440 V2.1.1 (2017-03)
Test Results	PASS
Remark:	This is SRD-2.4GHz radio test report.

Compiled by:	Reviewed by:	Approved by:
Willem Wang	Rita Xiao	Carson Zhang/Manager

The test report is effective only with both signature and specialized stamp.This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen BCTC Testing Co., Ltd, this report can't be reproduced except in full.The tested sample(s) and the sample information are provided by the client.

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(Note: N/A means not applicable)

1. VERSION

Report No.	Issue Date	Description	Approved
BCTC-FY180804824-2E	Aug. 30, 2018	Original	Valid

2. TEST SUMMARY

The Product has been tested according to the following specifications:

No.	Test Parameter	Clause No	Results
Transmitter Parameters			
1	Equivalent isotropically radiated power (e.i.r.p.)	4.2.2	N/A
2	Permitted range of operating frequencies	4.2.3	N/A
3	Spurious radiation for transmitter	4.2.4	N/A
4	Duty Cycle	4.2.5.4	N/A
5	Additional requirements for FHSS equipment	4.2.6	N/A
6	Adjacent channel selectivity	4.3.3	N/A
7	Blocking or desensitization	4.3.4	PASS
8	Spurious radiation for receiver	4.3.5	PASS
9	Spectrum access techniques	4.4	N/A
10	GBSAR antenna pattern	4.6.4	N/A
11	Limits for GBSAR	Annex F	N/A
Note: N/A is an abbreviation for Not Applicable and means this test intem is not applicable for this device according to the technology characteristic of device.			

3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

RF frequency	1×10^{-7}
RF power, conducted	1.38dB
Conducted spurious emission (30MHz-1GHz)	1.28dB
Conducted spurious emission (1GHz-18GHz)	1.576dB
Radiated Spurious emission (30MHz-1GHz)	4.3dB
Radiated Spurious emission (1GHz-18GHz)	4.5dB
Temperature	0.59℃
Humidity	5.3%

4. PRODUCT INFORMATION AND TEST SETUP

4.1 Product Information

Model(s):	GD-65A AT-66
Model Description:	The product is different for model number and outlook color.
Receiver Category:	2
Hardware Version:	N/A
Software Version:	N/A
Operation Frequency:	2402-2481MHz
Type of Modulation:	GFSK
Antenna installation:	Internal antenna
Ratings:	DC 3.7V from Battery DC 5V from Adapter

4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

4.3 Support Equipment

No.	Device Type	Brand	Model	Series No.	Data Cable	Power Cord
1.	---	---	---	---	---	---

Notes:

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

4.4 Channel List

CH No.	Frequency (MHz)	CH No.	Frequency (MHz)	CH No.	Frequency (MHz)	CH No.	Frequency (MHz)
1	2402	2	2403	3	2404	4	2405
5	2406	6	2407	7	2408	8	2409
9	2410	10	2411	11	2412	12	2413
13	2414	14	2415	15	2416	16	2417
17	2418	18	2419	19	2420	20	2421
21	2422	22	2423	23	2424	24	2425
25	2426	26	2427	27	2428	28	2429
29	2430	30	2431	31	2432	32	2433
33	2434	34	2435	35	2436	36	2437
37	2438	38	2439	39	2440	40	2441
41	2442	42	2443	43	2444	44	2445
45	2446	46	2447	47	2448	48	2449
49	2450	50	2451	51	2452	52	2453
53	2454	54	2455	55	2456	56	2457
57	2458	58	2459	59	2460	60	2461
61	2462	62	2463	63	2464	64	2465
65	2466	66	2467	67	2468	68	2469
69	2470	70	2471	71	2472	72	2473
73	2474	74	2475	75	2476	76	2477
77	2478	78	2479	79	2480	80	2481

4.5 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Low channel	Middle channel	High channel
Receiving	2402MHz	2441MHz	2481MHz

4.6 Test Environment

1.Extreme Test Conditions:
For tests at extreme temperatures, measurements shall be made over the extremes of the operating temperature range as declared by the manufacturer.
For tests at extreme voltages, measurements shall be made over the extremes of the power source voltage range as declared by the manufacturer.

Test Conditions	LTLV	LTHV	HTHV	HTLV
Temperature (℃)	10	10	40	40
Test Voltage (DC)	3.33	4.07	4.07	3.33

5. TEST FACILITY AND TEST INSTRUMENT USED

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at BCTC Building & 1-2F, East of B Building, Pengzhou Industrial, Fuyuan 1st Road, Qiaotou Community, Fuyong Street, Bao'an District, Shenzhen, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

5.2 Test Instrument Used

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Cal.Date	Cal.Due date
1	966 chamber	ChengYu	966 Room	966	Mar. 03, 2016	Mar. 02, 2019
2	Spectrum Analyzer	Aglient	E4407B	MY45109572	Jun. 20, 2018	Jun. 19, 2019
3	Amplifier	Schwarzbeck	BBV9718	9718-309	Jun. 20, 2018	Jun.19, 2019
4	Amplifier	Schwarzbeck	BBV9744	9744-0037	Jun. 20, 2018	Jun.19, 2019
5	TRILOG Broadband Antenna	schwarzbeck	VULB 9163	VULB9163-942	Jun. 23, 2018	Jun.22, 2019
6	Horn Antenna	SCHWARZBECK	BBHA9120D	1201	Jun. 23, 2018	Jun.22, 2021
7	band rejection filter	ZBSF	ZBSF-C2441.5	1706003605	Aug. 15, 2018	Aug. 14, 2019
8	Signal Generator	Keysight	N5181A	MY50143748	Jun. 20, 2018	Jun.19, 2019
9	Communication test set	R&S	CMU200	119435	Aug. 06, 2018	Aug. 05, 2019
10	Communication test set	Agilent	N4010A	MY49081107	Aug. 06, 2018	Aug. 05, 2019
11	Spectrum Analyzer	Keysight	N9020A	MY49100060	Jul. 11, 2018	Jul. 10, 2019
12	Signal Generator	Keysight	N5182B	MY56200519	Jun. 20, 2018	Jun.19, 2019
13	Power Sensor	Keysight	E9 300A	/	Apr. 15, 2018	Apr. 14, 2019

6. RECEIVER BLOCKING

6.1 Applicability

This requirement applies to Equipment Category 1 and Category 2 receivers, when invoked, as defined in EN 300440 V2.1.1 clause 4.3.4.

6.2 Limits

The blocking level, for any frequency within the specified ranges, shall not be less than the values given in table ,except at frequencies on which spurious responses are found.

Receiver category	Limit
1	-30 dBm + k
2	-45 dBm + k
3	No limit

The correction factor, k, is as follows:

k = 20log f -10log BW

Where:

- f is the frequency in GHz;
- BW is the channel bandwidth in MHz.

The factor k is limited within the following:

- 0 < k < 40 dB.

6.3 Test procedures

This measurement shall be conducted under normal conditions.

Two signal generators A and B shall be connected to the receiver via a combining network to the receiver, either:

a) via a test fixture or a test antenna to the receiver integrated, dedicated or test antenna; or

b) directly to the receiver permanent or temporary antenna connector.

The method of coupling to the receiver shall be stated in the test report.

Signal generator A shall be at the nominal frequency of the receiver, with normal modulation of the wanted signal.

Signal generator B shall be unmodulated and shall be adjusted to a test frequency at approximately 10 times, 20 times and 50 times of the receive channel bandwidth above upper band edge of the receive channel.

Initially signal generator B shall be switched off and using signal generator A the level which still gives sufficient response shall be established. The output level of generator A shall then be increased by 3 dB.

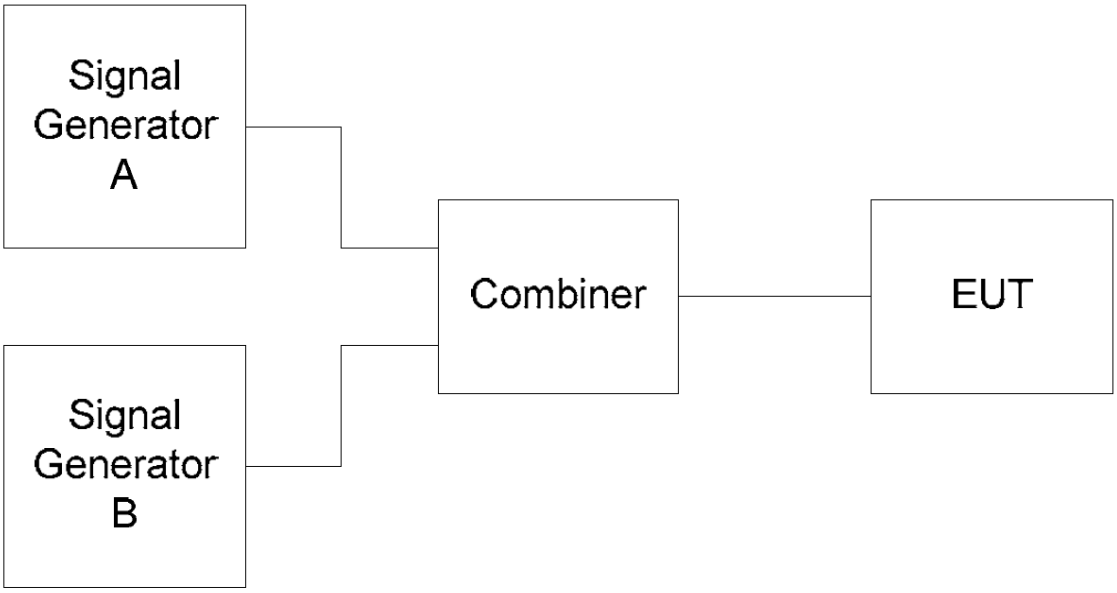
Signal generator B is then switched on and adjusted until the wanted criteria are met. This level shall be recorded.

The measurement shall be repeated with the test frequency for signal generator B at approximately 10 times, 20 times and 50 times of the receive channel bandwidth below the lower band edge of the receive channel.

The blocking or desensitization shall be recorded as the level in dBm of lowest level of the unwanted signal (generator B).

For tagging systems (e.g. RF identification, anti-theft, access control, location and similar systems) signal generator A may be replaced by a physical tag positioned at 70 % of the measured system range in metres. In this case, the blocking or desensitization shall be recorded as the ratio in dB of lowest level of the unwanted signal (generator B) resulting in a non-read of the tag. to the declared sensitivity of the receiver +3 dB.

6.4 Test setup layout



6.5 Test results

PASS

7. SPURIOUS RADIATION FOR RECEIVER

7.1 Applicability

Applies to all receivers, except receivers used in combination with permanently co-located transmitters continuously transmitting, when invoked, as defined in EN 300440 V2.1.1 clause 4.3.5.

7.2 Limits

The power of any spurious emission shall not exceed 2 nW in the range 25 MHz to 1 GHz and shall not exceed 20 nW on frequencies above 1 GHz.

7.3 Test procedures

30MHz ~ 1GHz:

a. The Product was placed on the nonconductive turntable 1.5m above the ground in a full anechoic chamber.

b. Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 120 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.

c. For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value.

Above 1GHz:

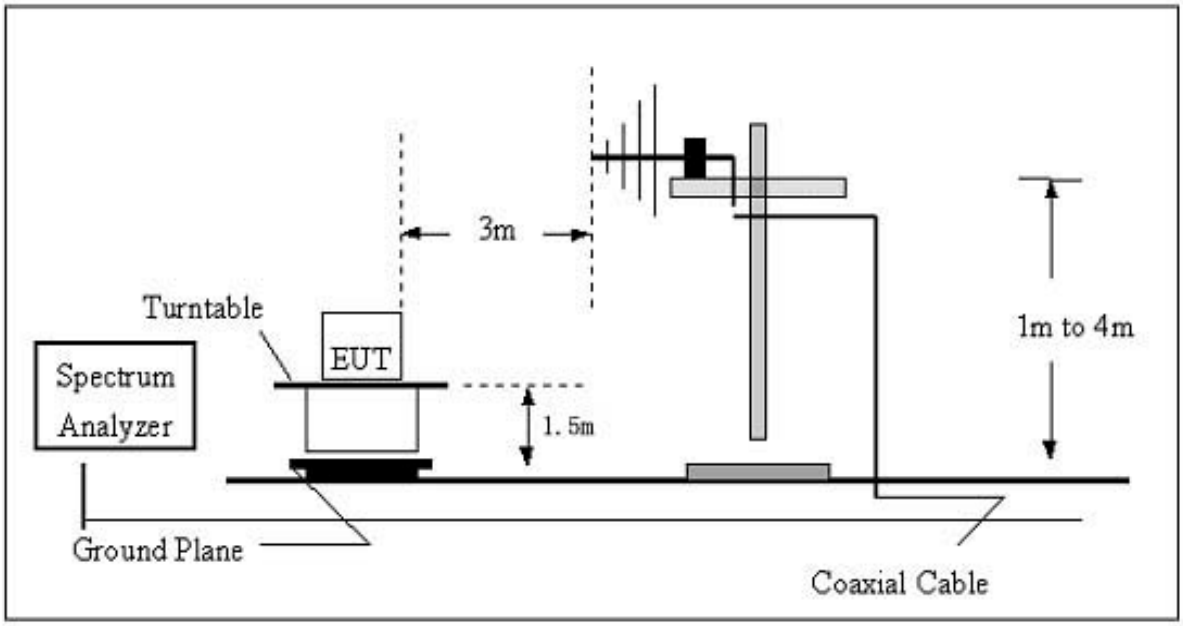
a. The Product was placed on the non-conductive turntable 1.5 m above the ground in a full anechoic chamber..

b. Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.

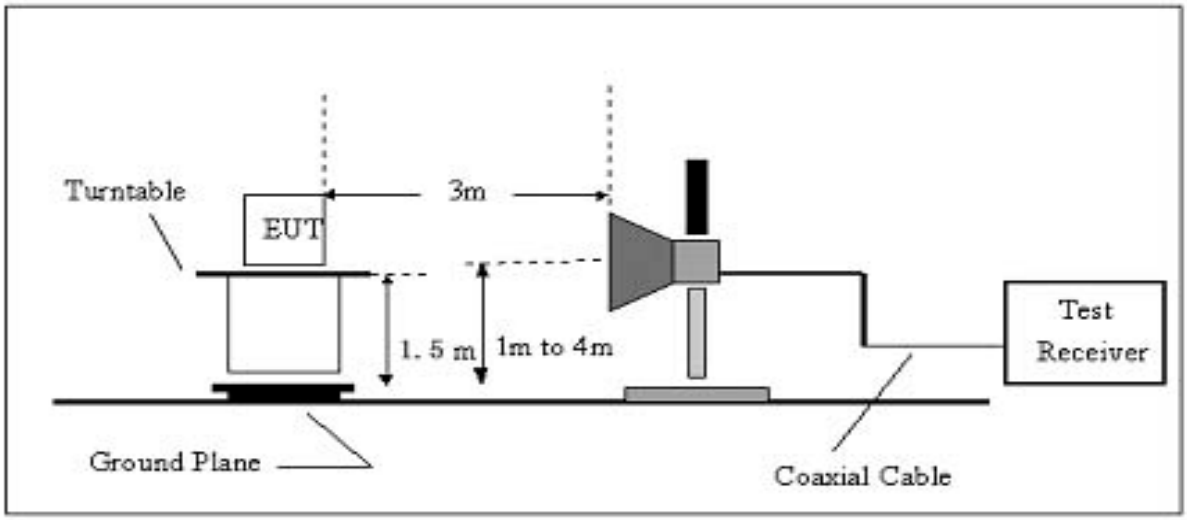
c. For each frequency whose maximum record was higher or close to limit, measure its AV value: rotate the turntable from 0 to 360 degrees to find the degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to AV value and specified bandwidth with Maximum Hold Mode, and record the maximum value.

7.4 Test setup layout

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-Up Frequency Above 1 GHz



7.5 Test results

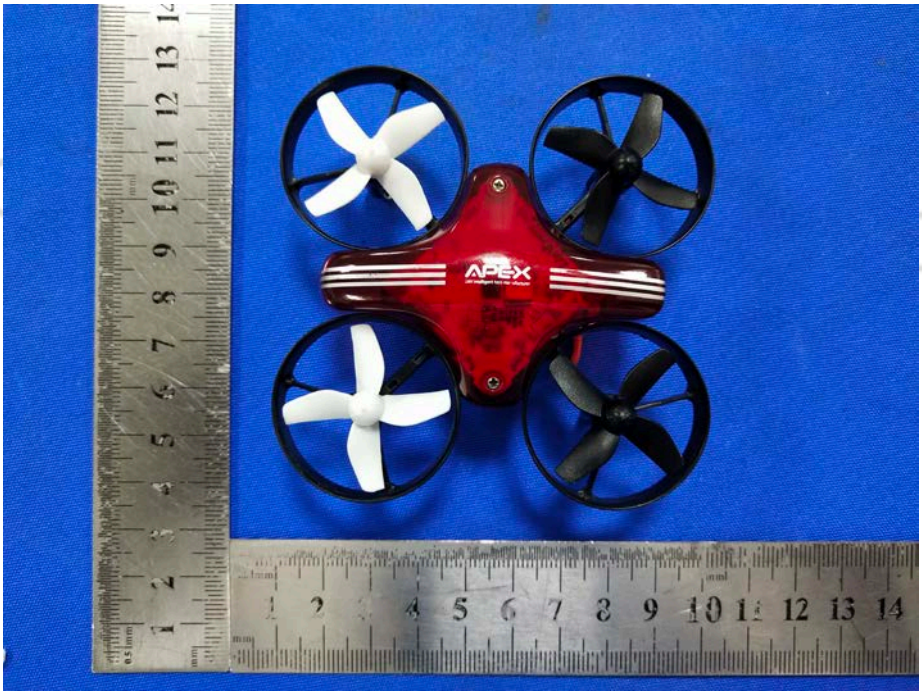
Frequency	Receiver Reading	Turn table Angle	RX Antenna		Substituted			Absolute Level	Result	
			Height	Polar	SG Level	Cable	Antenna Gain		Limit	Margin
(MHz)	(dBμV)	Degree	(m)	(H/V)	(dBm)	(dB)	(dB)	(dBm)	(dBm)	(dB)
GFSK low channel										
245.93	41.37	147	1.1	H	-68.34	0.15	0.00	-68.49	-57	-11.49
245.93	43.64	239	1.2	V	-63.35	0.15	0.00	-63.50	-57	-6.50
2334.86	40.46	328	1.5	H	-72.92	0.34	10.50	-62.76	-47	-15.76
2334.86	46.93	276	1.4	V	-65.70	0.34	10.50	-55.54	-47	-8.54
GFSK High channel										
245.93	41.87	56	1.6	H	-67.84	0.15	0.00	-67.99	-57	-10.99
245.93	44.04	229	1.2	V	-62.95	0.15	0.00	-63.10	-57	-6.10
2334.86	40.47	71	1.6	H	-72.91	0.34	10.50	-62.75	-47	-15.75
2334.86	48.35	3	1.5	V	-64.28	0.34	10.50	-54.12	-47	-7.12

8. EUT PHOTOGRAPHS

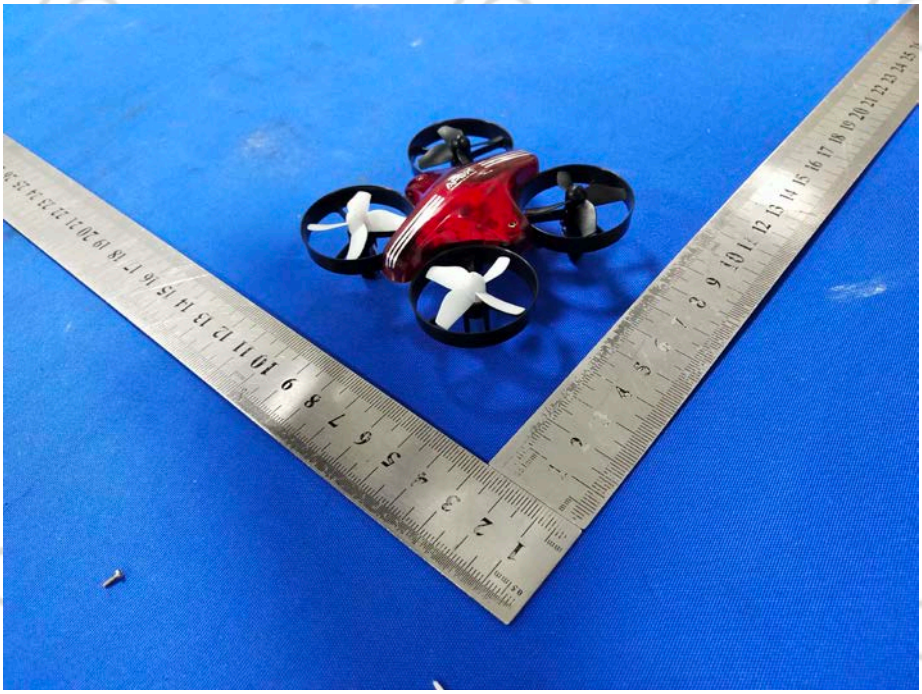
EUT Photo 1

EUT Photo 2

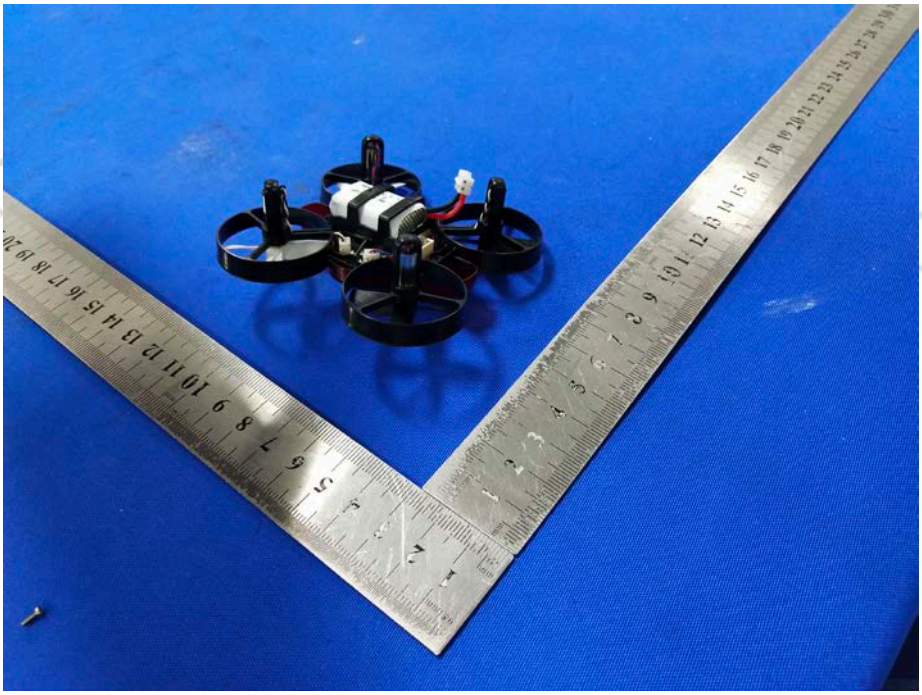
EUT Photo 3



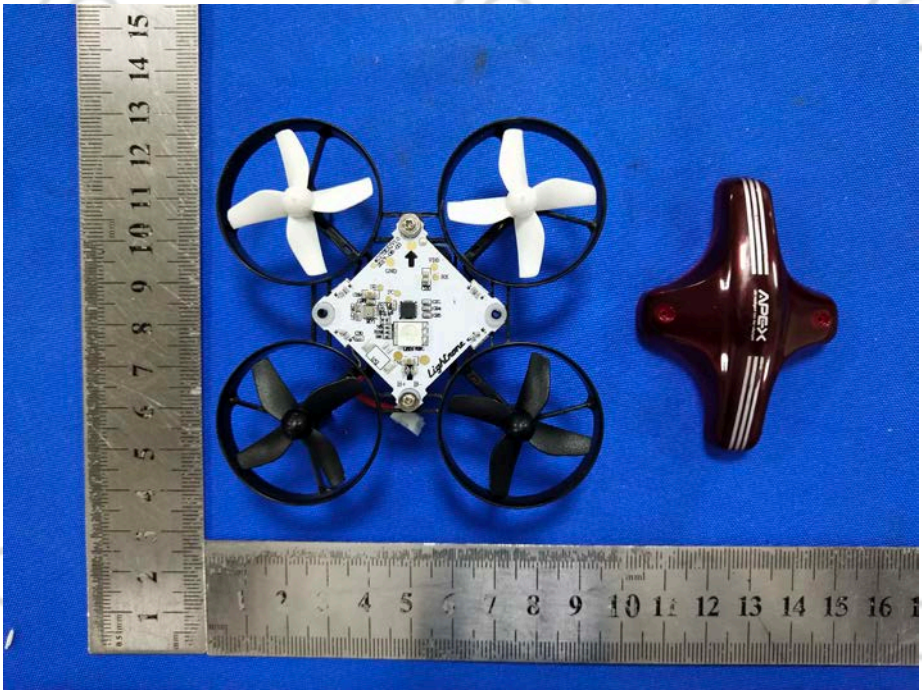
EUT Photo 4



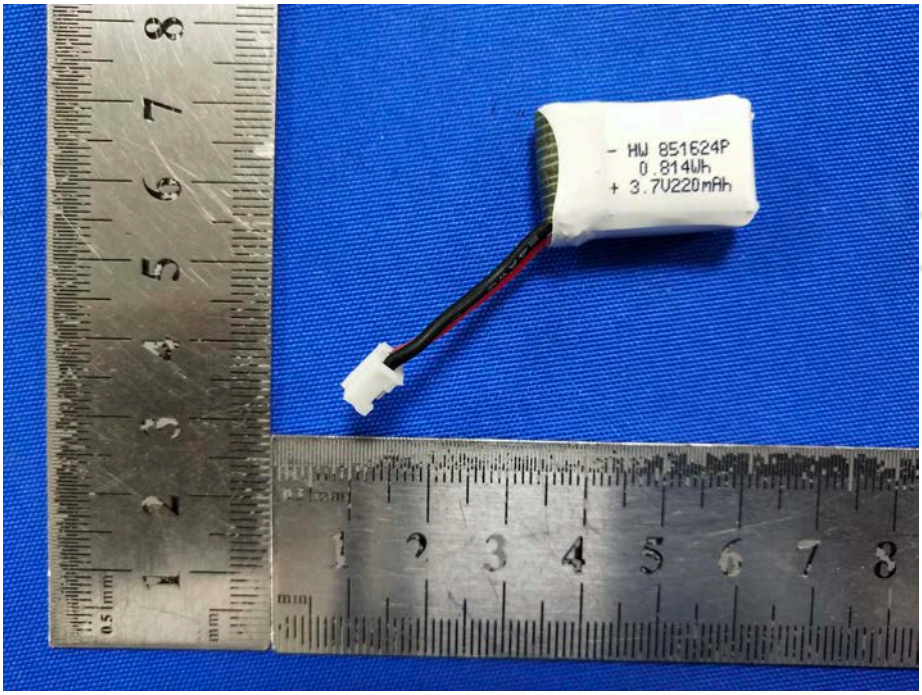
EUT Photo 5



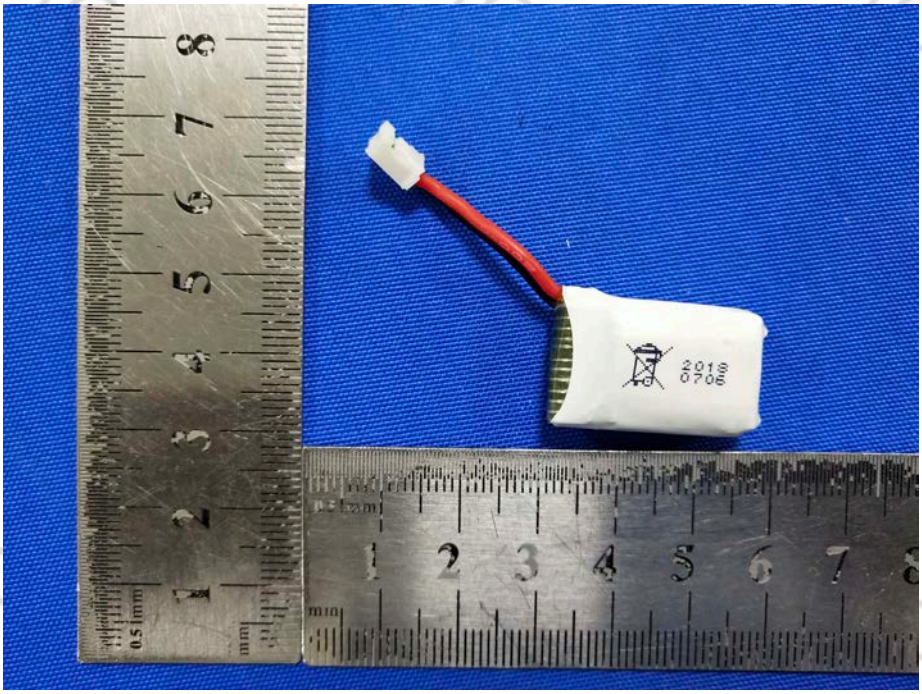
EUT Photo 6



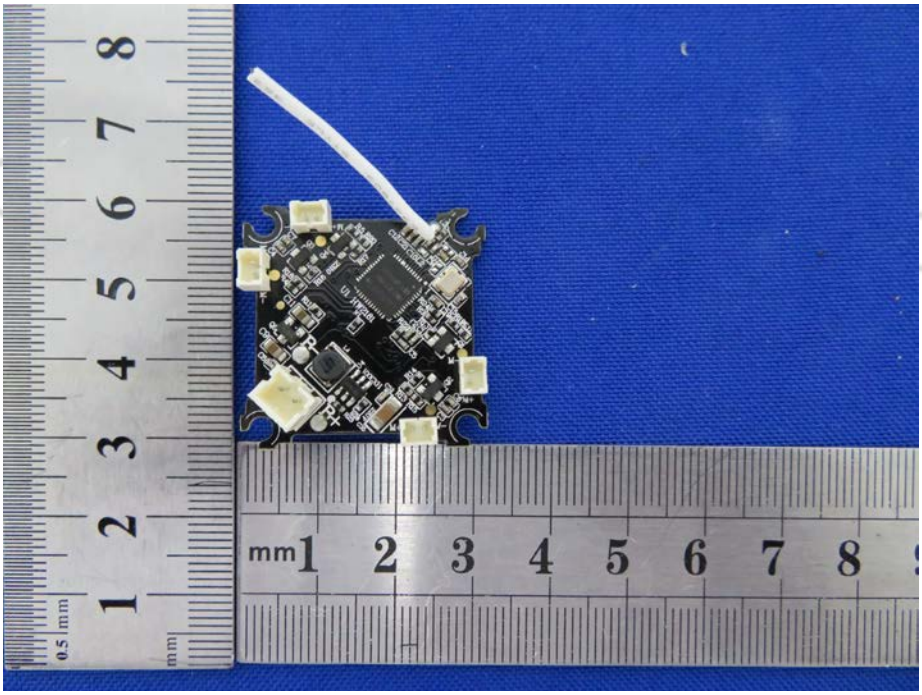
EUT Photo 7



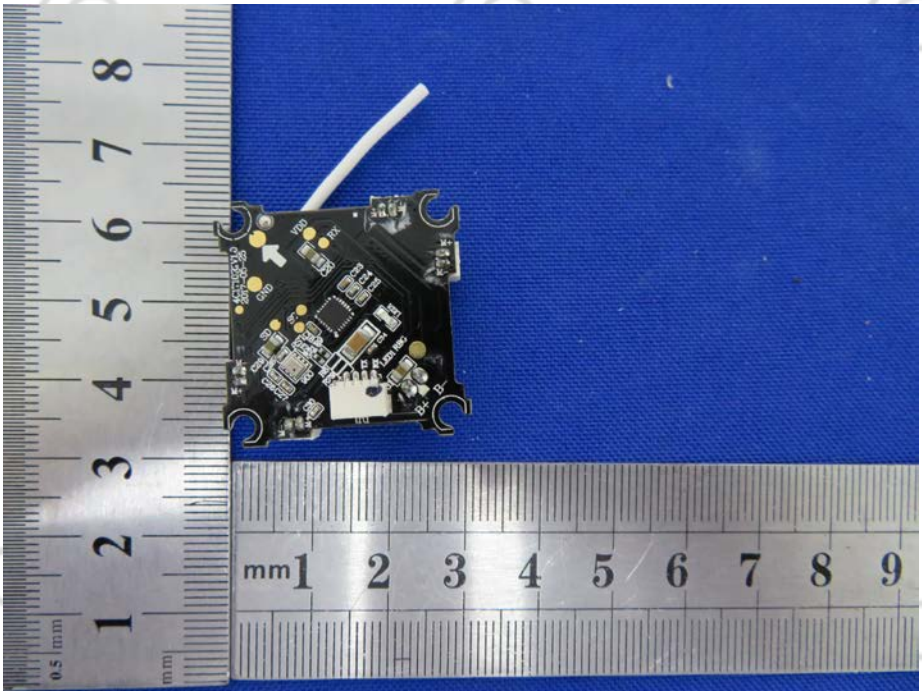
EUT Photo 8



EUT Photo 9



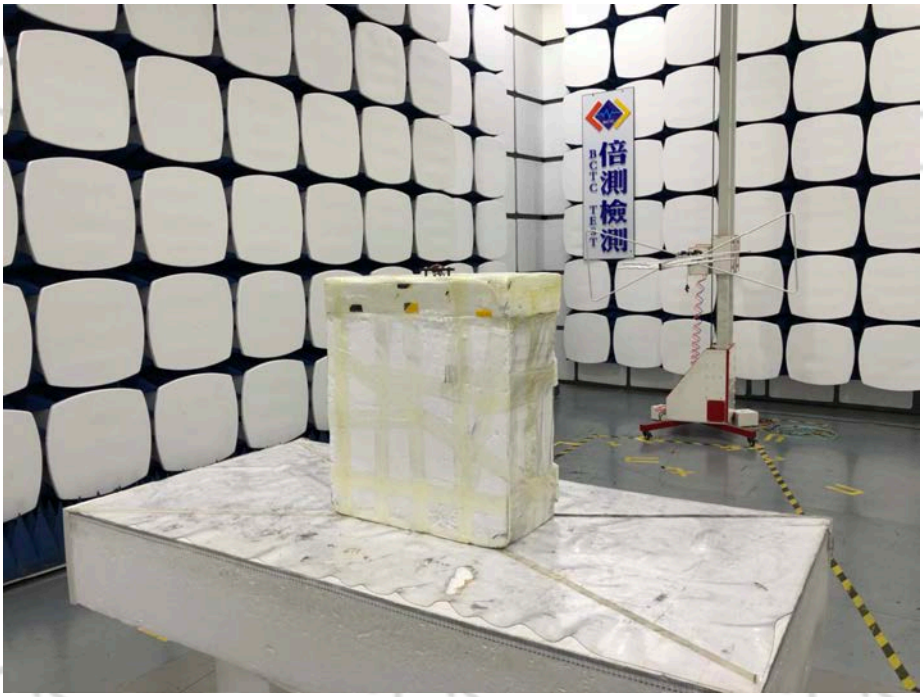
EUT Photo 10



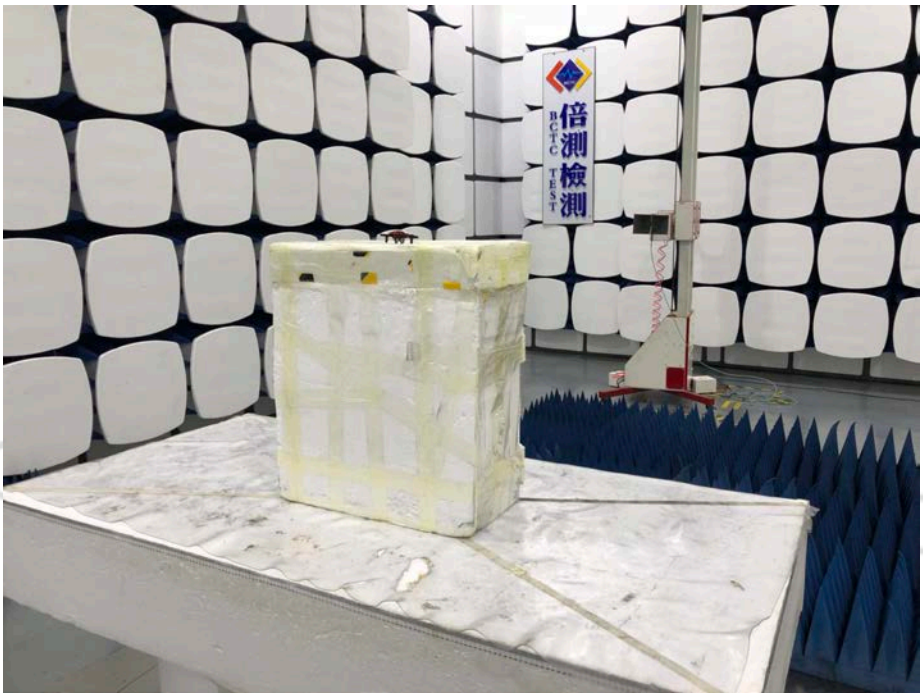
9. EUT TEST SETUP PHOTOGRAPHS

Spurious emissions

Below 1G



Above 1G



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