



Report No.SH16110074E02

FCC EMC TEST REPORT

Issued to

Shanghai Sunly Technology Co., Ltd.

For

Alpha CAM Drone

Model Name : SUNLY17A
Trade Name : SUNLYTECH
Brand Name : Alpha CAM
Standard : 47 CFR Part 15 Subpart B
FCC ID : 2AKX4-SUNLY17A
Test date : Jan. 20, 2017 to Feb. 6, 2017
Issue date : Feb. 10, 2017



By
Shanghai Skylabs Co., Ltd.

Tested by Huang Yun

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Review by Xiao dong Wei

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**Change History**

Issue	Date	Reason for change
1.0	Feb. 10, 2017	First edition



1. General Information

1.1 Applicant

Shanghai Sunly Technology Co., Ltd.

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1.2 Manufacturer

Shanghai Sunly Technology Co., Ltd.

D1106.D-1108.Minggu Science&Technology Park,No.7001 Zhongchun Rd.,Shanghai,China



1.3 Description of EUT

EUT Name.....: Alpha CAM Drone
Model Name.....: SUNLY17A
Brand Name.....: Alpha CAM
Trade Name.....: SUNLYTECH
Hardware Version.....: V1.05
Software Version.....: V1.0.5
Modulation Type.....: OFDM (802.11g/n/a)
Frequency Range.....: 2.412GHz - 2.462GHz
5.725 GHz -5.850GHz
Channel Number.....: Refer to tables below

For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

2.4GHz Band Frequency Channel

g: Ch No.	n20: Ch No.	n40: Ch No.	Center Frequency (MHz)
1	1		2412
2	2		2417
3	3	3	2422
4	4	4	2427
5	5	5	2432
6	6	6	2437
7	7	7	2442
8	8	8	2447
9	9	9	2452
10	10		2457
11	11		2462
11 Channels	11 Channels	7 Channels	



5.8GHz Band Frequency Channel

a20: Ch No.	Center Frequency (MHz)
149	5745
	5755
153	5765
157	5785
	5795
161	5805
165	5825
5 Channels	



2. Facilities and Accreditations

2.1 Test Facility

ShanghaiSkylabs Co., Ltd. (Skylabs Laboratory) is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. FCC listed: 196218, IC listed: 21609.

The accreditation certificate number is L6644. A 9*6*6(m) fully anechoic chamber was used for the radiated spurious emissions test.

2.2 Environmental Conditions

Ambient temperature: 15~35°C

Relative humidity: 30~60%

Atmosphere pressure: 86-106kPa

2.3 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

Uncertainty of Conducted Emission: $\pm 1.76\text{dB}$

Uncertainty of Radiated Emission: $\pm 3.16\text{dB}$



2.4 List of Equipments Used

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
3m Semi-anechoic Chamber	czchengyu	9m*6m*6m	SAR	2016.04.11	3years
Shielding Room	CHENGYU	5m×4m×3m	CR	2016.04.11	3years
EMI Test Receiver	R&S	ESCI7	100787	2017.01.28	1year
Broadband Trilog Antenna	Schwarzbeck	VULB 9163	9163-561	2016.07.25	2year
Broadband Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-1033	2015.07.25	2year
Dual-line V-network	TESTQ	NNB 51	33285	2017.01.28	1year
Power Supplier	NF	ES2000S	9087735	2016.10.17	1year

NOTE:

Equipments listed above have been calibrated and are in the period of validation.

2.5 Accessories

NO.	Product	Brand	Model	Serial No.	Remark
1	Laptop PC	Lenovo	X200	44C0970	
2	Adaptor	Lenovo	42T4416	98N4A0	
3	USB Cable	CE—LINK	Type-C	N/A	



2.6 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart B:

No.	Identity	Document Title
1	47 CFR Part 15 (e-CFR data is current as of February 6, 2017)	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Result
1	15.107	Conducted Emission	PASS
2	15.109	Radiated Emission	PASS
3	ANSI C63.4-2014	Radiated Emission	PASS



3. Test Conditions Setting

3.1 Test Mode

With testing software which was provided by the applicant and installed on a laptop PC, the equipment under test (EUT) could be set to a continuous transmit mode with a certain modulation scheme and data rate on a certain frequency.

For this test report, all configurations of the EUT were tested in 2.4G and 5.8GHz frequency band which was able to operate according to the specification of 802.11 a/g/n. The table below includes the worst case operation mode during the tests:

Operation Mode		Description of the Operation Mode	Modulation	Data Rate
1	On Air	TX Mode 2412MHz(Channel 1)	64QAM	54Mbps
2	On Ground	TX Mode 5825MHz(Channel 165) + Charger + USB data exchange	OFDM	54Mbps

NOTE:

In mode 2, the battery of EUT is at low power level, the Charger is charging the battery in common conditions similar to the way did by USER.

Mains supply for Adaptor: 120V, AC 60Hz

Only the worst case in certain test is recorded separately in following sections.



4. Emission Tests

4.1 Conducted Emission Measurement

4.1.1 Limits of Conducted Emission:

According to FCC section 15.107, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

Frequency (MHz)	CLASS B (dB μ V)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

NOTE:

(1) The lower limit shall apply at the band edges.

(2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

4.1.2 Test Procedure

The EUT and support equipment, if needed, were set up as per the test configuration to simulate typical usage per the user's manual. When 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 C63.4 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane, which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.

EUT connected to Class B Computer/Laptop via USB data cable and data exchange mode. The Computer/Laptop installed by US power 120V/60Hz, through a Line Impedance Stabilization Network (LISN), which was supplied power source and was grounded to the ground plane.

The test program of the EUT was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150KHz to 30MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

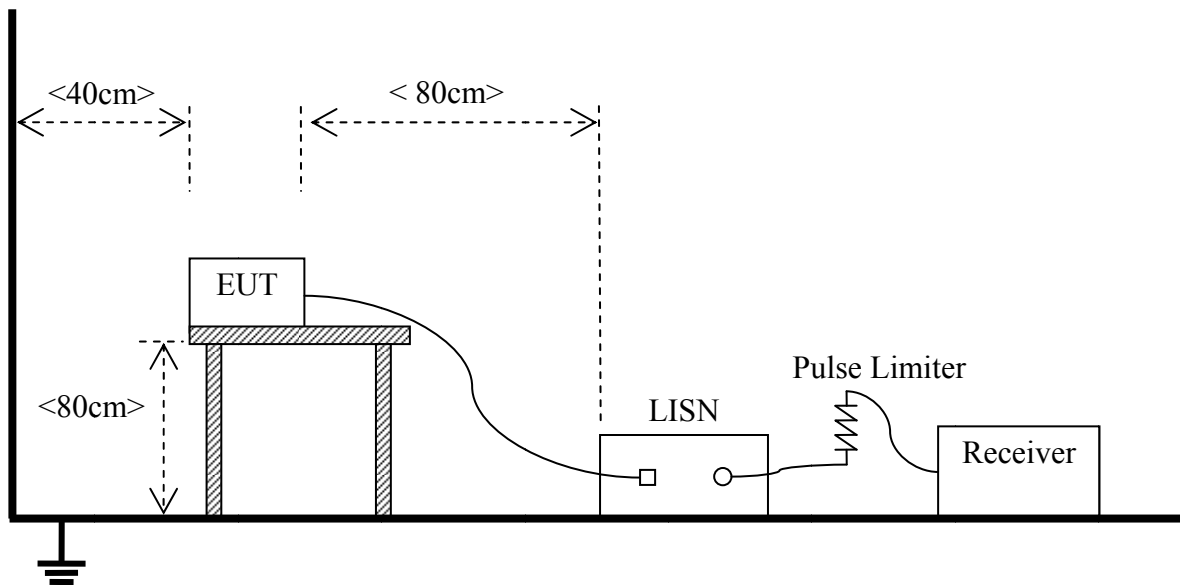
The test mode(s) described in Item 3.1 were scanned during the preliminary test.

After the preliminary scan, we found the test mode described in Item 3.1 producing the highest emission level.

The worst configuration of EUT and cable of the above highest emission level were recorded for reference of the final test.



4.1.3 Test Setup



4.1.4 Test Result

Test Verdict Recorded for Mode 2:

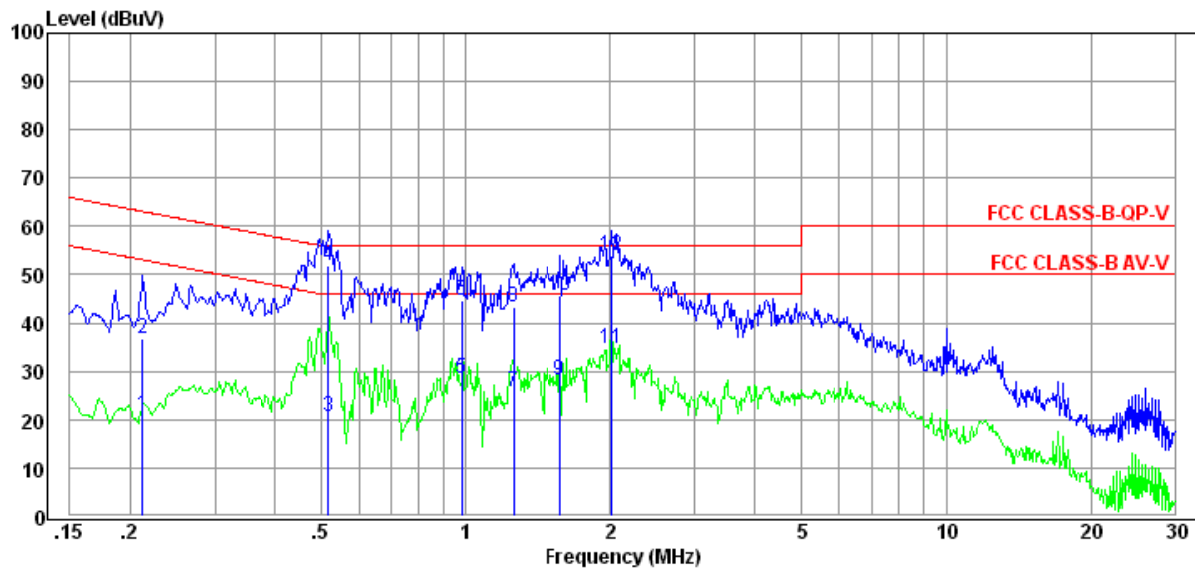
Frequency (MHz)	Level (dB μ V)	Limit Line (dB μ V)	Margin (dB)	Phase line	Detector
0.21	20.92	53.10	32.18	L	Average
0.21	36.80	63.10	26.30	L	QP
0.52	20.79	46.00	25.21	L	Average
0.52	52.04	56.00	3.96	L	QP
0.98	28.62	46.00	17.38	L	Average
0.98	44.83	56.00	11.17	L	QP
1.26	25.67	46.00	20.33	L	Average
1.26	43.33	56.00	12.67	L	QP
1.57	28.32	46.00	17.68	L	Average
1.57	45.75	56.00	10.25	L	QP
2.01	34.83	46.00	11.17	L	Average
2.01	54.10	56.00	1.90	L	QP
0.26	24.76	51.34	26.58	N	Average
0.26	39.77	61.34	21.57	N	QP
0.49	39.60	46.14	6.54	N	Average
0.49	52.45	56.14	3.69	N	QP
0.53	34.13	46.00	11.87	N	Average
0.53	54.49	56.00	1.51	N	QP



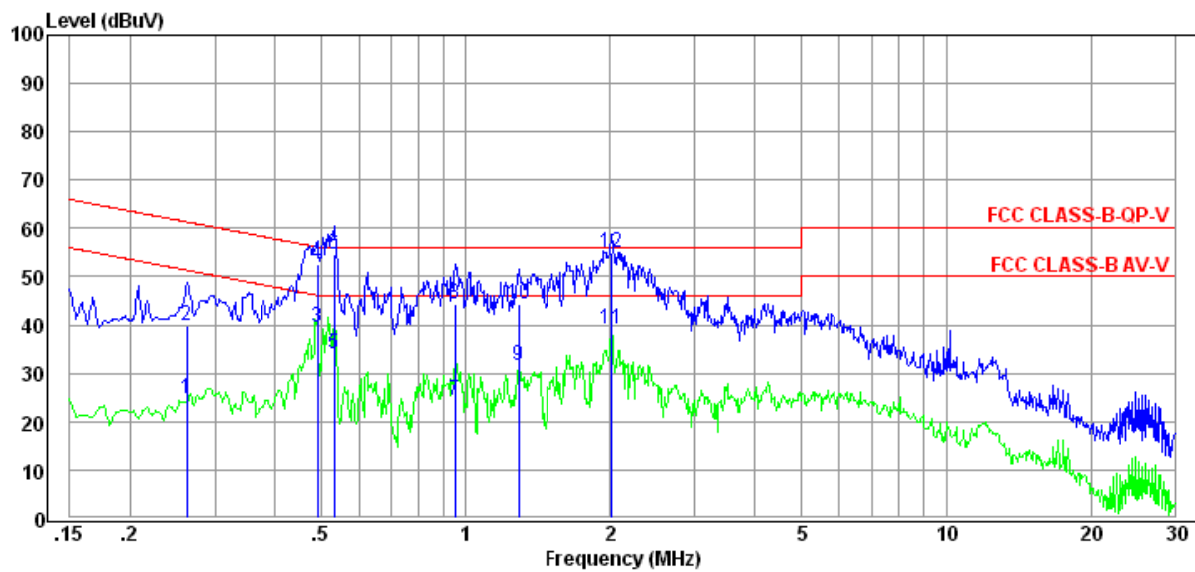
Frequency (MHz)	Level (dB μ V)	Limit Line (dB μ V)	Margin (dB)	Phase line	Detector
0.95	24.52	46.00	21.48	N	Average
0.95	44.20	56.00	11.80	N	QP
1.29	31.64	46.00	14.36	N	Average
1.29	44.29	56.00	11.71	N	QP
2.01	39.15	46.00	6.85	N	Average
2.01	54.91	56.00	1.09	N	QP



4.1.5 Test Plot



L Line



N Line

4.1.6 Conclusion: Pass



4.2 Radiated Emission Measurement

4.2.1 Limits of Radiated Emission

According to FCC section 15.109, the field strength of radiated emissions from unintentional radiators at a certain distance shall not exceed the following values:

Frequency (MHz)	Field Strength CLASS B (at 3m)	
	$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

NOTE:

(1) *Field Strength ($\text{dB}\mu\text{V/m}$) = $20 \cdot \log[\text{Field Strength } (\mu\text{V/m})]$.*

(2) *In the emission tables above, the tighter limit applies at the band edges.*

Frequency range of radiated measurements (For unintentional radiators)

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.
1.705-108	1000.
108-500	2000.
500-1000	5000.
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.



4.2.2 Test Procedure

The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.

Support equipment, if needed, was placed as per ANSI C63.4.

All I/O cables were positioned to simulate typical usage as per ANSI C63.4.

The EUT received AC power source from the outlet socket under the turntable. All support equipment power received from another socket under the turntable.

The antenna was placed at 3 or 10 meter away from the EUT as stated in ANSI C63.4. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.

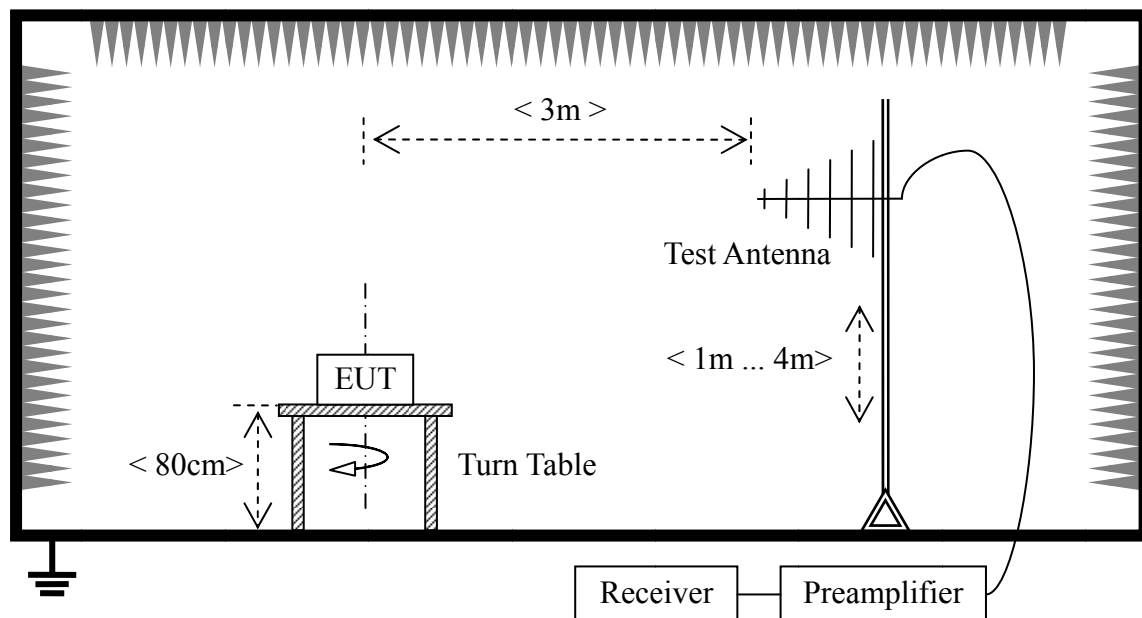
The Analyzer / Receiver quickly scanned from 30MHz to 40GHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

The test mode(s) described in Item 3.1 were scanned during the preliminary test:

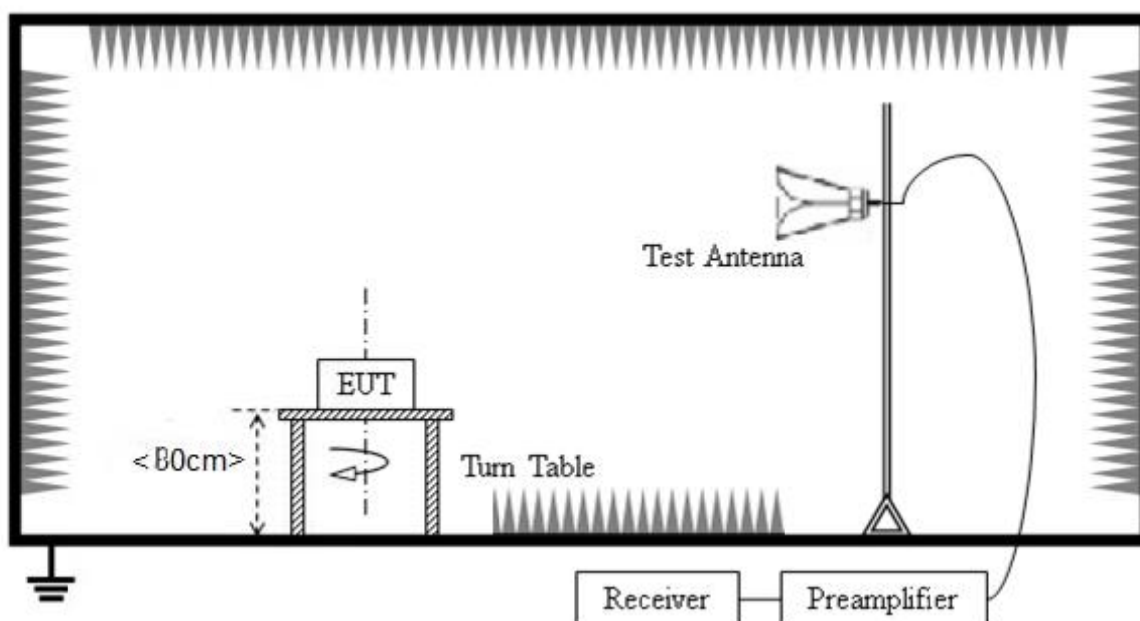
After the preliminary scan, we found the test mode described in Item 3.1 producing the highest emission level.

The worst configuration of EUT and cable of the above highest emission level were recorded for reference of the final test

4.2.3 Test Setup



Radiated Emissions 30-1000MHz



Radiated Emissions above 1000MHz

4.2.4 Test Result

Test Verdict Recorded for Mode 1 (30MHz~1GHz and above 1GHz):

No.	Frequency (MHz)	Emission Level (dB μ V/m)		Quasi-Peak Limit (dB μ V/m)	Margin (dB)	Detector	Result
		Result (dB μ V)	Antenna Polarization				
1	59.86	24.71	V	40.00	15.29	QP	PASS
2	67.68	20.66	V	40.00	19.34	QP	PASS
3	81.21	19.11	V	40.00	20.89	QP	PASS
4	95.43	21.63	V	40.00	18.37	QP	PASS
5	451.14	30.67	V	47.00	16.33	QP	PASS
6	649.66	32.32	V	47.00	14.68	QP	PASS
7	1882.29	43.66	V	70.00	26.34	Peak	PASS
8	2288.26	32.36	V	50.00	17.64	Average	PASS
9	2414.63	77.15	V	50.00	-27.15	Average	PASS
10	2414.63	80.39	V	70.00	-10.39	Peak	PASS
11	3216.29	34.01	V	54.00	19.99	Average	PASS
12	3216.29	48.30	V	74.00	25.7	Peak	PASS
13	4821.88	52.87	V	54.00	1.13	Average	PASS
14	4821.88	66.14	V	74.00	7.86	Peak	PASS
15	47.99	20.56	H	40.00	19.44	QP	PASS
16	104.17	20.05	H	40.00	19.95	QP	PASS
17	180.65	21.62	H	40.00	18.38	QP	PASS



18	235.82	25.69	H	47.00	21.31	QP	PASS
19	400.43	34.02	H	47.00	12.98	QP	PASS
20	649.66	34.42	H	47.00	12.58	QP	PASS
21	2288.26	33.22	H	50.00	16.78	Average	PASS
22	2288.26	45.50	H	70.00	24.5	Peak	PASS
23	2414.63	80.42	H	70.00	-10.42	Peak	PASS
24	2418.96	77.47	H	50.00	-27.47	Average	PASS
25	3216.29	35.22	H	54.00	18.78	Average	PASS
26	3216.29	49.83	H	74.00	24.17	Peak	PASS
27	4830.53	53.82	H	54.00	0.18	Average	PASS
28	4830.53	72.20	H	74.00	1.8	Peak	PASS

Note: the frequency above 6 GHz is identified as floor noise, the record is ignored.

4.2.5 Conclusion: Pass



Annex A Photos of the EUT





Annex B Photos of Test Setup

1. Conducted Emission

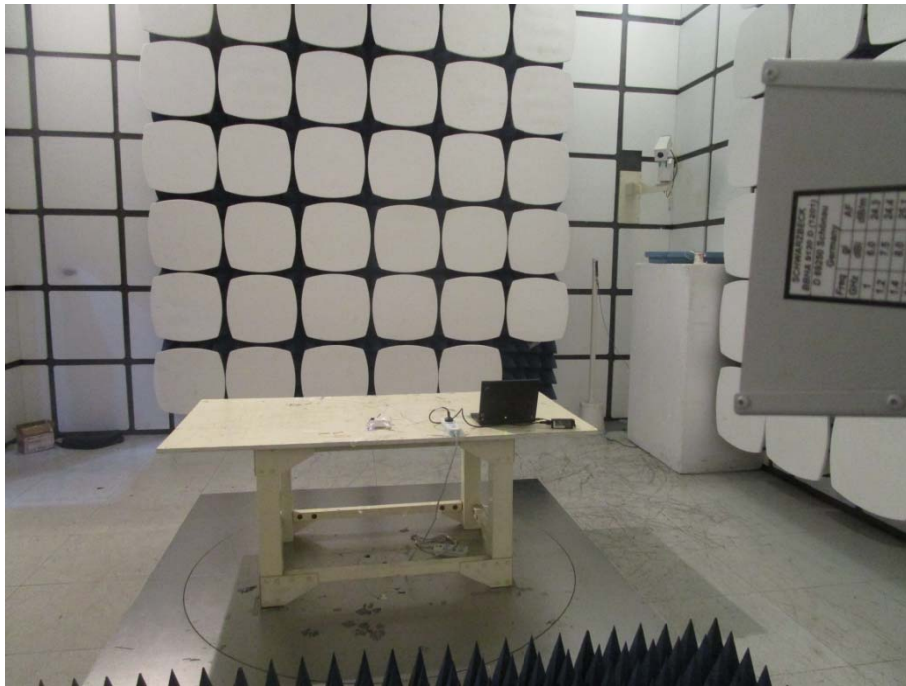


150k~30MHz

2. Radiated Emission



30M~1GHz



above 1GHz

**** END OF REPORT ****