FCC TEST REPORT

Client Name	:	**SHANGHAI LEDSTAR ELECTRONIC TECHNOLOGY CO.,LTD**
Client Address	:	**3rd Floor, No. 355 Beiying Road, Qingpu District, Shanghai, China**
Product Name	:	**Full-spectrum LED Aquarium Light**
Report Date	:	**Aug. 11, 2022**

Shenzhen Anbotek Compliance Laboratory Limited

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TEST REPORT

Applicant	:	SHANGHAI LEDSTAR ELECTRONIC TECHNOLOGY CO.,LTD
Manufacturer	:	SHANGHAI LEDSTAR ELECTRONIC TECHNOLOGY CO.,LTD
Product Name	:	Full-spectrum LED Aquarium Light
Model No.	:	AQ-S, AQ-X, AQ-N, AQ-J, AQ-Z, AQ-F, AQ-D, AQ-M, AQ-W, AQ-C, AQ-G, AQ-T
Trade Mark	:	LEDSTAR®
Rating(s)	:	Input: 24V⎓ 1.75A (with DC 3.7V, 110mAh battery inside)

Test Standard(s)	:	**FCC Part15 Subpart C, Section 15.247**
Test Method(s)	:	**ANSI C63.10: 2020, KDB558074 D01 DTS Meas Guidance v05r02**

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Receipt	Jun. 20, 2022
Date of Test	Jun. 20~Aug. 11, 2022
Prepared By	(Ella Liang)
Approved & Authorized Signer	(Kingkong Jin)

1. General Information

1.1. Client Information

Applicant	:	SHANGHAI LEDSTAR ELECTRONIC TECHNOLOGY CO.,LTD
Address	:	3rd Floor, No. 355 Beiying Road, Qingpu District, Shanghai, China
Manufacturer	:	SHANGHAI LEDSTAR ELECTRONIC TECHNOLOGY CO.,LTD
Address	:	3rd Floor, No. 355 Beiying Road, Qingpu District, Shanghai, China
Factory	:	SHANGHAI LEDSTAR ELECTRONIC TECHNOLOGY CO.,LTD
Address	:	3rd Floor, No. 355 Beiying Road, Qingpu District, Shanghai, China

1.2. Description of Device (EUT)

Product Name	:	Full-spectrum LED Aquarium Light	
Model No.	:	AQ-S, AQ-X, AQ-N, AQ-J, AQ-Z, AQ-F, AQ-D, AQ-M, AQ-W, AQ-C, AQ-G, AQ-T (Note: All samples are the same except for the model number, power, electric current, adapter and appearance design, so we prepare AQ-S & AQ-X for conducted emission and radiated emission test. Other items are test for AQ-S only.)	
Trade Mark	:	LEDSTAR®	
Test Power Supply	:	AC 120V, 60Hz for adapter	
Test Sample No.	:	1-2-1(Normal Sample), 1-2-2(Engineering Sample)	
Product Description	:	Operation Frequency:	2402~2480MHz
		Number of Channel:	40 Channels
		Modulation Type:	GFSK
		Antenna Type:	PCB antenna
		Antenna Gain(Peak):	2 dBi (Provided by customer)
		Adapter 1 for AQ-S	Model: GM42-240175-1A Input: 100V-240V~50/60Hz 1.5A Output: 24V⎓ 1.75A
		Adapter 2 for AQ-X	Model: GM152-3600430-F Input: 100V-240V~50/60Hz 2.5A Output: 36.0V⎓ 4.3A, 154.8W
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 2) This report is for BLE module.			

1.3. Auxiliary Equipment Used During Test

N/A		

1.4. Description of Test Modes

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description		
BLE_1M	Mode 1	CH00	TX+Charging/ TX Only
	Mode 2	CH19	
	Mode 3	CH39	
BLE_2M	Mode 4	CH00	TX+Charging/ TX Only
	Mode 5	CH19	
	Mode 6	CH39	

Note:

(1) The measurements are performed at the highest, middle, lowest available channels.

(2)The data rate was set in 1Mbps for radiated emission due to the highest RF output power.

1.5. List of channels

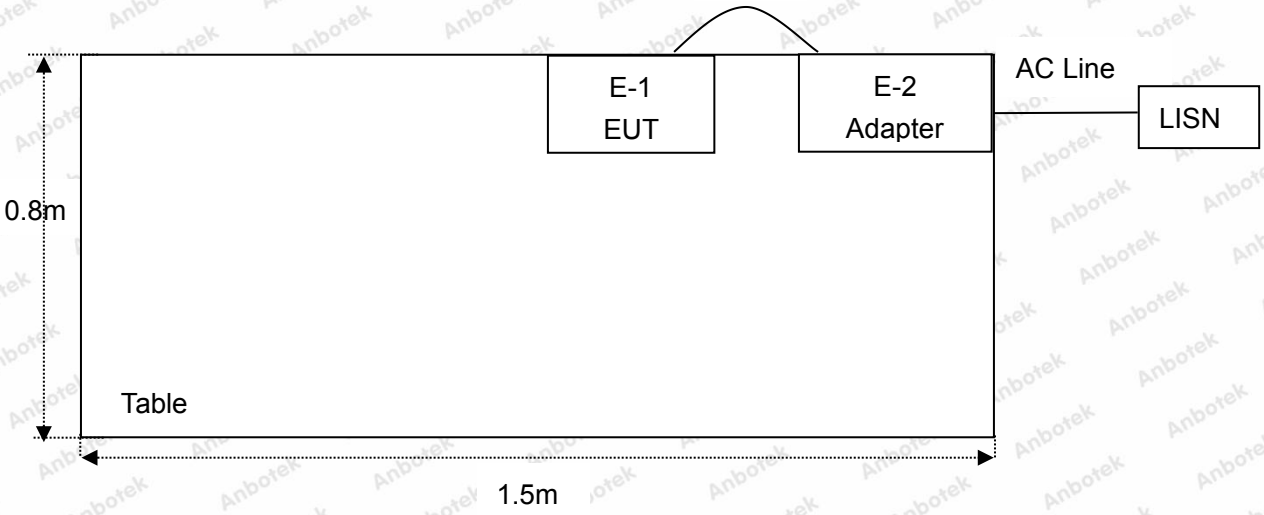
Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
00	2402	09	2420	18	2438	27	2456	36	2474
01	2404	10	2422	19	2440	28	2458	37	2476
02	2406	11	2424	20	2442	29	2460	38	2478
03	2408	12	2426	21	2444	30	2462	39	2480
04	2410	13	2428	22	2446	31	2464		
05	2412	14	2430	23	2448	32	2466		
06	2414	15	2432	24	2450	33	2468		
07	2416	16	2434	25	2452	34	2470		
08	2418	17	2436	26	2454	35	2472		

Note:

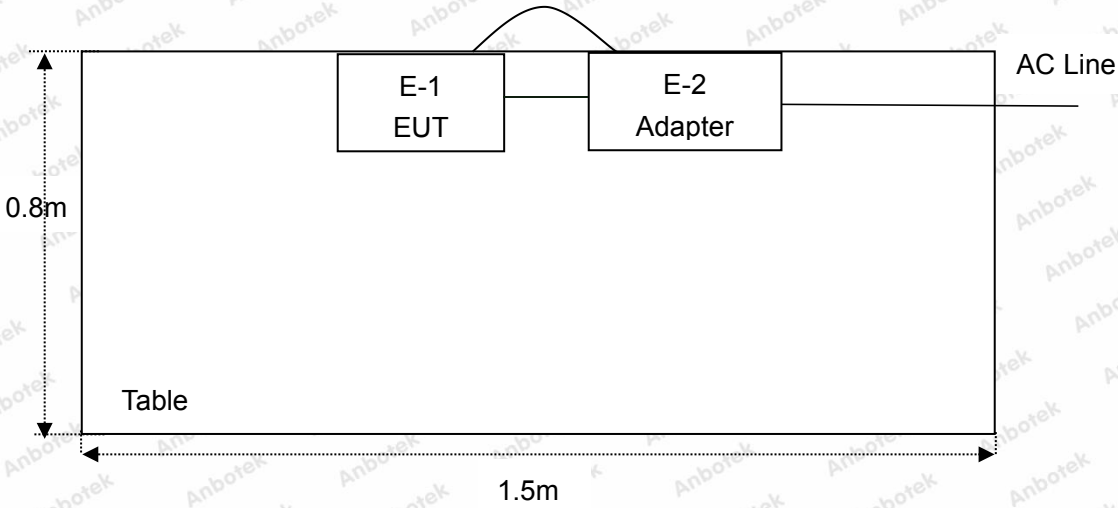
1. The engineering test program was provided and the EUT was programmed to be in continuously transmitting mode.
2. EUT built-in battery-powered, fully-charged battery use of the test battery.

1.6. Description Of Test Setup

CE



RE



1.7. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Three Phase V-type Artificial Power Network	CYBERTEK	EM5040DT	E215040DT001	Jul 05, 2022	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Oct. 22, 2021	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESR26	101481	Oct. 22, 2021	1 Year
4.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Oct. 22, 2021	1 Year
5.	MAX Spectrum Analysis	Agilent	N9020A	MY51170037	Oct. 22, 2021	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30D	KD17503	Oct. 22, 2021	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Oct. 22, 2021	2 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Oct. 22, 2021	2 Year
9.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Oct. 22, 2021	2 Year
10.	Horn Antenna	A-INFO	LB-180400-KF	J211060628	Oct. 22, 2021	2 Year
11.	Pre-amplifier	SONOMA	310N	186860	Oct. 22, 2021	1 Year
12.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
13.	RF Test Control System	YIHENG	YH3000	2017430	Oct. 22, 2021	1 Year
14.	Power Sensor	DAER	RPR3006W	15I00041SN045	Oct. 22, 2021	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN046	Oct. 22, 2021	1 Year
16.	MXA Spectrum Analysis	KEYSIGHT	N9020A	MY53280032	Oct. 22, 2021	1 Year
17.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Oct. 22, 2021	1 Year
18.	Signal Generator	Agilent	E4421B	MY41000743	Oct. 22, 2021	1 Year
19.	DC Power Supply	IVYTECH	IV3605	1804D360510	Oct. 22, 2021	1 Year
20.	Constant Temperature Humidity Chamber	ZHONGJIAN	ZJ-KHWS80B	N/A	Oct. 22, 2021	1 Year

1.8. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 3.9 dB (Horizontal)
		Ur = 3.8 dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4 dB

1.9. Description of Test Facility

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

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, 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. 184111.

ISED-Registration No.: 8058A

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A.

Test Location

Shenzhen Anbotek Compliance Laboratory Limited.
1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

1.10. Model No. List

Model	Voltage / Current	Power
AQ-S	Input: 24V⎓ 1A~6.35A	22~144W
AQ-X	Input: 36V⎓ 4.3A	144W
AQ-N	Input: 24V⎓ 1A	22W
AQ-J	Input: 36V⎓ 1A~4.3A	35~140W
AQ-Z	Input: 36V⎓ 1A~4.3A	35~140W
AQ-F	Input: 24V⎓ 4A	96W
AQ-D	Input: 24V⎓ 1A~4A	10~96W
AQ-M	Input: 24V⎓ 1A~4A	22~96W
AQ-W	Input: 36V⎓ 2.8A~4.3A	35~140V
AQ-C	Input: 24V⎓ 1~4A	22~96W
AQ-G	Input: 24V⎓ 1~4A	22~96W
AQ-T	Input: 24V⎓ 1~4A	22~96W

2. Summary of Test Results

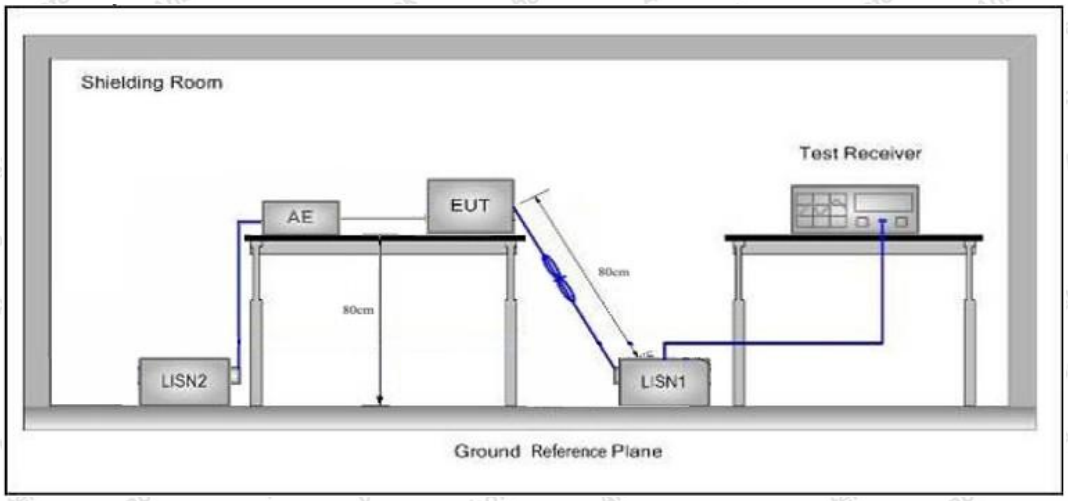
Standard Section	Test Item	Result
15.203/15.247(c)	Antenna Requirement	PASS
15.207	Conducted Emission	PASS
15.205/15.209	Spurious Emission	PASS
15.247(b)(3)	Conducted Peak Output Power	PASS
15.247(a)(2)	6dB Occupied Bandwidth	PASS
15.247(e)	Power Spectral Density	PASS
15.247(d)	Band Edge	PASS
Remark: “N/A” is an abbreviation for Not Applicable.		

3. Conducted Emission Test

3.1. Test Standard and Limit

Test Standard	FCC Part15 Section 15.207		
Test Limit	Frequency	Maximum RF Line Voltage (dBuV)	
		Quasi-peak Level	Average Level
	150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
	500kHz~5MHz	56	46
	5MHz~30MHz	60	50
Remark: (1) *Decreasing linearly with logarithm of the frequency. (2) The lower limit shall apply at the transition frequency.			

3.2. Test Setup



3.3. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.10: 2020 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9kHz.

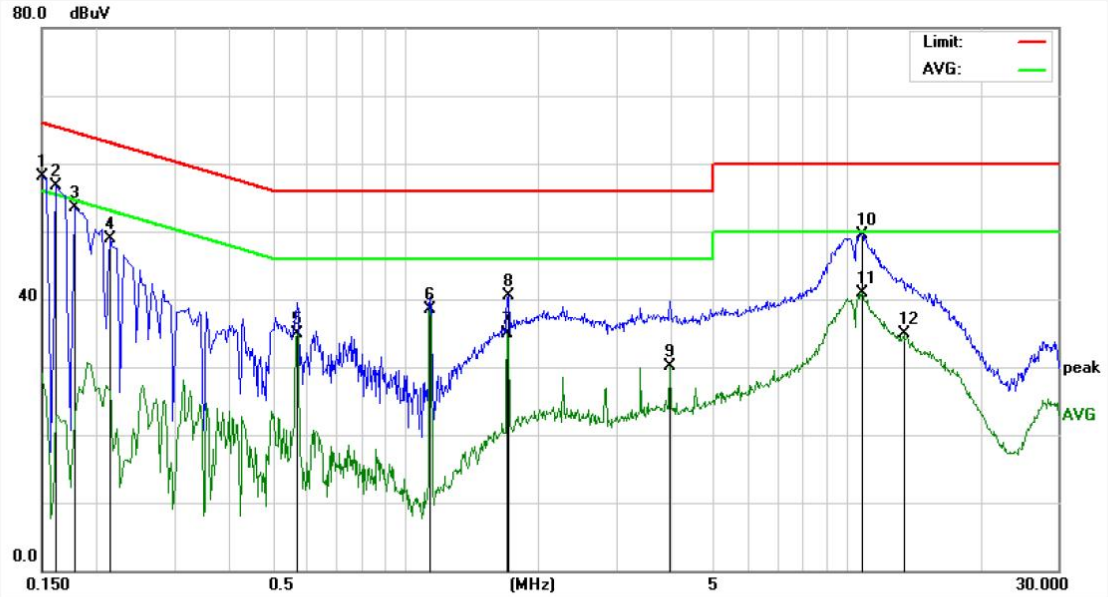
The frequency range from 150kHz to 30MHz is checked.

3.4. Test Data

During the test, pre-scan all modes, only the worst case is recorded in the report.

Conducted Emission Test Data

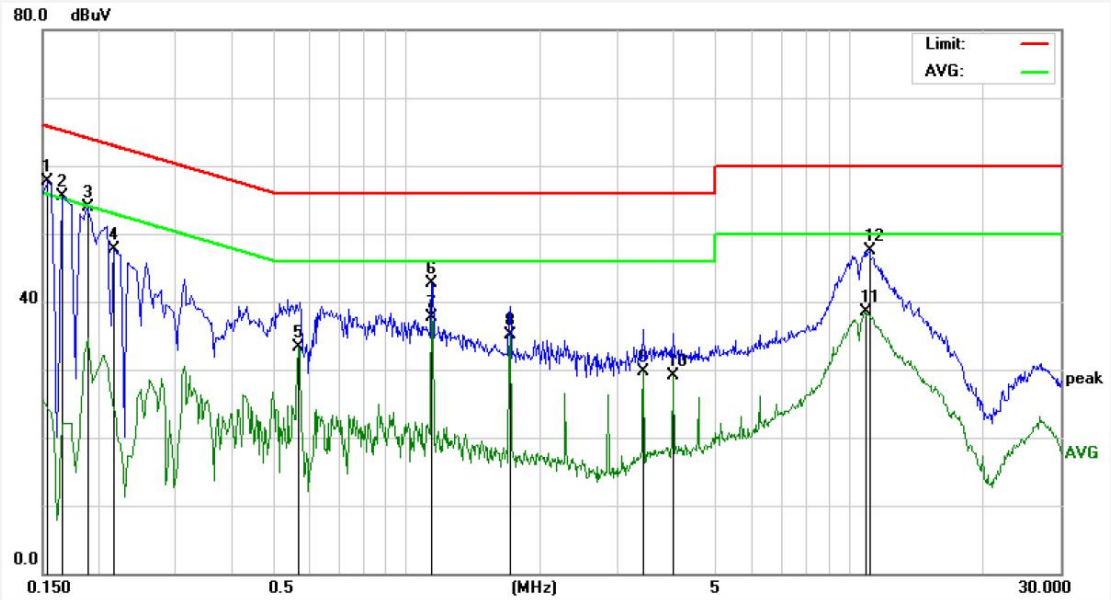
Test Site: 1# Shielded Room
Test Model: AQ-S
Operating Condition: Mode 1
Test Specification: AC 120V, 60Hz for adapter 1
Comment: Live Line
Tem.: 22.8℃ Hum.: 51%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1500	48.33	9.69	58.02	65.99	-7.97	QP	
2	0.1620	46.97	9.70	56.67	65.36	-8.69	QP	
3	0.1780	43.78	9.71	53.49	64.57	-11.08	QP	
4	0.2140	39.21	9.71	48.92	63.04	-14.12	QP	
5	0.5700	25.17	9.76	34.93	46.00	-11.07	AVG	
6	1.1380	28.74	9.74	38.48	46.00	-7.52	AVG	
7	1.7020	25.19	9.73	34.92	46.00	-11.08	AVG	
8	1.7100	30.81	9.73	40.54	56.00	-15.46	QP	
9	3.9740	20.29	9.74	30.03	46.00	-15.97	AVG	
10	10.8300	39.74	9.86	49.60	60.00	-10.40	QP	
11	10.8300	31.00	9.86	40.86	50.00	-9.14	AVG	
12	13.4460	24.91	9.94	34.85	50.00	-15.15	AVG	

Conducted Emission Test Data

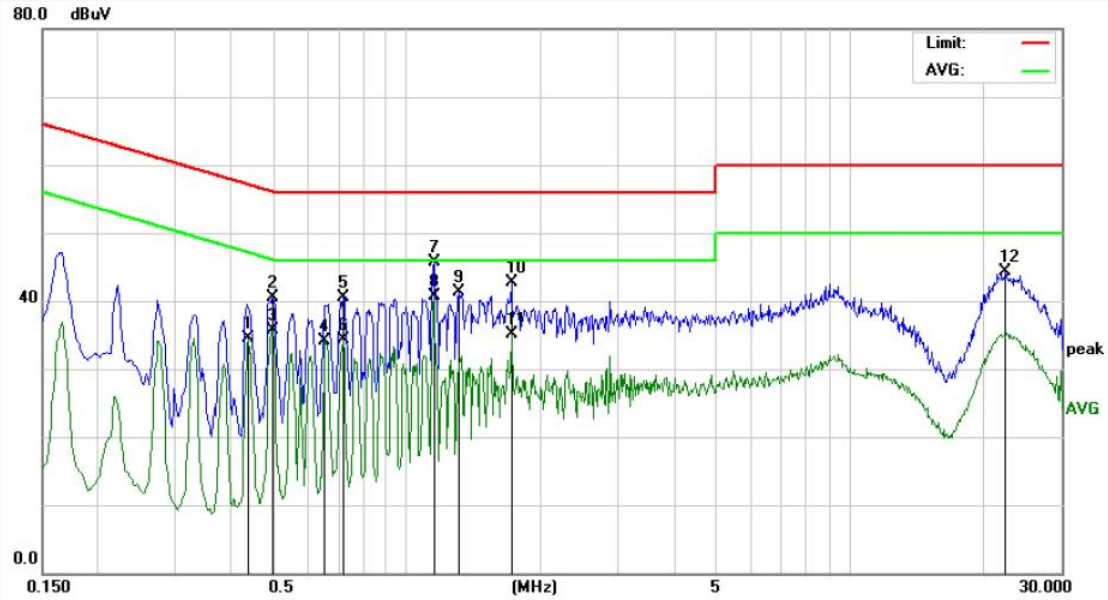
Test Site: 1# Shielded Room
Test Model: AQ-S
Operating Condition: Mode 1
Test Specification: AC 120V, 60Hz for adapter 1
Comment: Neutral Line
Tem.: 22.8℃ Hum.: 51%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1539	48.01	9.70	57.71	65.78	-8.07	QP	
2	0.1660	45.89	9.70	55.59	65.15	-9.56	QP	
3	0.1900	44.24	9.71	53.95	64.03	-10.08	QP	
4	0.2180	37.91	9.71	47.62	62.89	-15.27	QP	
5	0.5700	23.46	9.76	33.22	46.00	-12.78	AVG	
6	1.1380	32.88	9.74	42.62	56.00	-13.38	QP	
7	1.1380	27.96	9.74	37.70	46.00	-8.30	AVG	
8	1.7100	25.32	9.73	35.05	46.00	-10.95	AVG	
9	3.4180	20.00	9.73	29.73	46.00	-16.27	AVG	
10	3.9900	19.43	9.73	29.16	46.00	-16.84	AVG	
11	10.8340	28.56	9.86	38.42	50.00	-11.58	AVG	
12	11.1140	37.65	9.86	47.51	60.00	-12.49	QP	

Conducted Emission Test Data

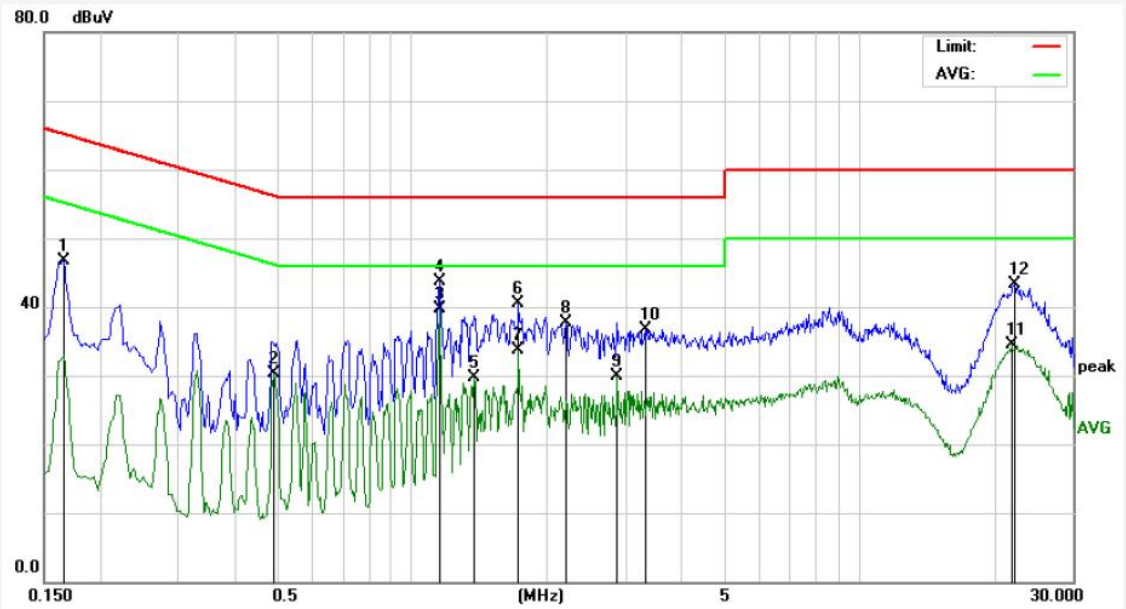
Test Site: 1# Shielded Room
Test Model: AQ-X
Operating Condition: Mode 1
Test Specification: AC 120V, 60Hz for adapter 2
Comment: Live Line
Tem.: 22.8℃ Hum.: 51%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.4380	24.82	9.74	34.56	47.10	-12.54	AVG	
2	0.4980	30.72	9.76	40.48	56.03	-15.55	QP	
3	0.4980	25.87	9.76	35.63	46.03	-10.40	AVG	
4	0.6540	24.37	9.75	34.12	46.00	-11.88	AVG	
5	0.7180	30.66	9.75	40.41	56.00	-15.59	QP	
6	0.7180	24.55	9.75	34.30	46.00	-11.70	AVG	
7	1.1500	35.97	9.74	45.71	56.00	-10.29	QP	
8	1.1500	30.99	9.74	40.73	46.00	-5.27	AVG	
9	1.3140	31.64	9.73	41.37	56.00	-14.63	QP	
10	1.7220	32.96	9.73	42.69	56.00	-13.31	QP	
11	1.7220	25.44	9.73	35.17	46.00	-10.83	AVG	
12	22.4700	34.25	10.11	44.36	60.00	-15.64	QP	

Conducted Emission Test Data

Test Site: 1# Shielded Room
Test Model: AQ-X
Operating Condition: Mode 1
Test Specification: AC 120V, 60Hz for adapter 2
Comment: Neutral Line
Tem.: 22.8℃ Hum.: 51%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1660	37.10	9.70	46.80	65.15	-18.35	QP	
2	0.4900	20.48	9.76	30.24	46.17	-15.93	AVG	
3	1.1500	29.96	9.74	39.70	46.00	-6.30	AVG	
4	1.1539	33.93	9.74	43.67	56.00	-12.33	QP	
5	1.3779	19.96	9.73	29.69	46.00	-16.31	AVG	
6	1.7260	30.84	9.73	40.57	56.00	-15.43	QP	
7	1.7260	23.89	9.73	33.62	46.00	-12.38	AVG	
8	2.2100	28.06	9.72	37.78	56.00	-18.22	QP	
9	2.8780	20.09	9.73	29.82	46.00	-16.18	AVG	
10	3.3140	27.04	9.73	36.77	56.00	-19.23	QP	
11	21.8620	24.35	10.11	34.46	50.00	-15.54	AVG	
12	22.2939	33.28	10.11	43.39	60.00	-16.61	QP	

4. Radiation Spurious Emission and Band Edge

4.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.209 and 15.205				
Test Limit	Frequency (MHz)	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~1000MHz	500	54.0	Quasi-peak	3
	Above 1000MHz	500	54.0	Average	3
		-	74.0	Peak	3

Remark:
(1)The lower limit shall apply at the transition frequency.
(2) 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.

4.2. Test Setup

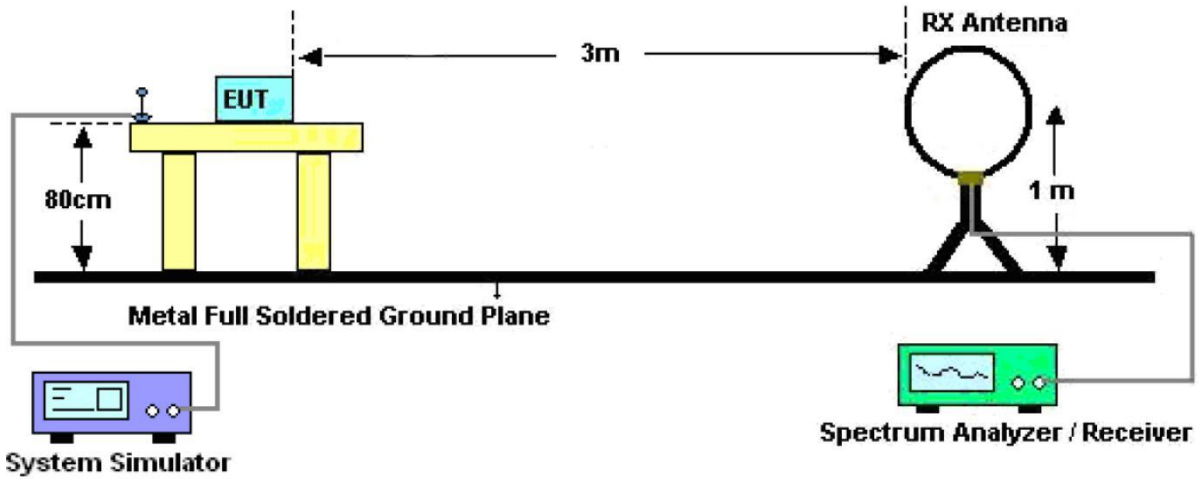


Figure 1. Below 30MHz

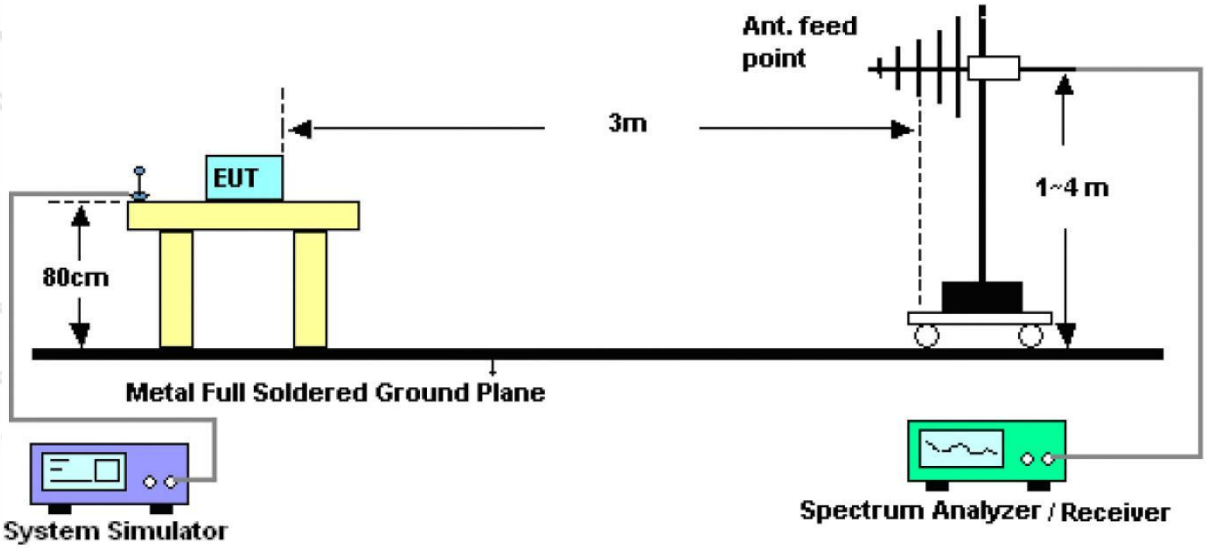


Figure 2. 30MHz to 1GHz

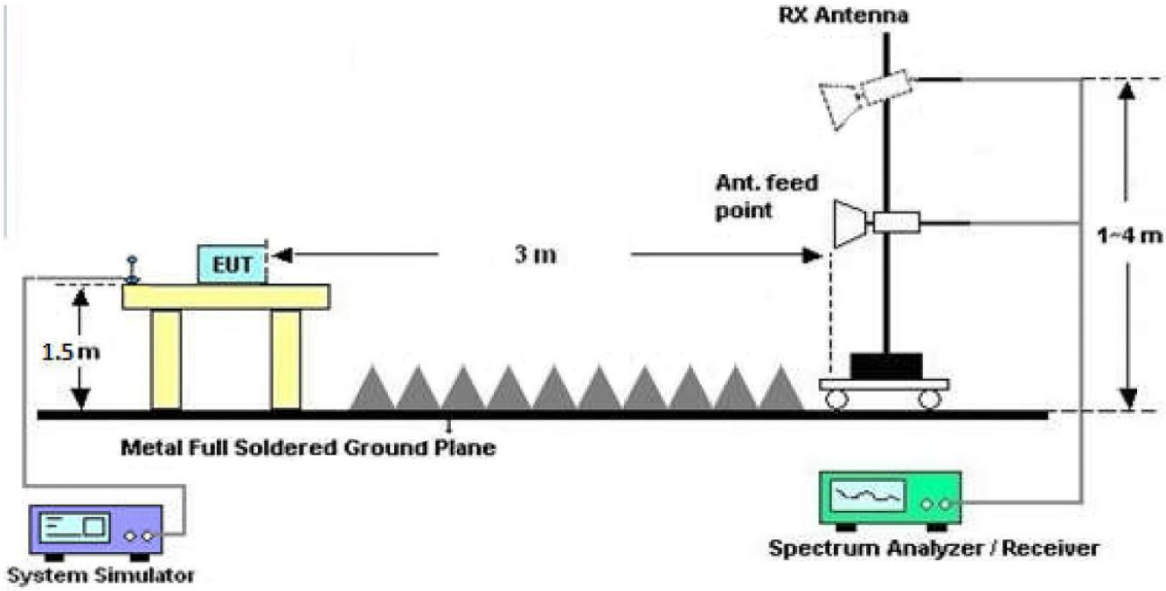


Figure 3. Above 1 GHz

4.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.
For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.
The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.

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.

For 9kHz to 150kHz, Set the spectrum analyzer as:
RBW = 200Hz, VBW =1kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:
RBW = 9KHz, VBW =30kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 30MHz to 1000MHz, Set the spectrum analyzer as:
RBW = 100kHz, VBW =300kHz,Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For above 1GHz,Set the spectrum analyzer as:
RBW =1MHz, VBW =1MHz, Detector= Peak, Trace mode= Max hold, Sweep- auto couple.
For average measurement:
–VBW=10Hz, When duty cycle is no less than 98 percent
–VBW⩾1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation, so refer to this clause 5.4 duty cycle.

4.4. Test Data

PASS

During the test, pre-scan all the modes, only the worst case is recorded in the report.

The test results of 9kHz-30MHz was attenuated more than 20dB below the permissible limits, so the results don't record in the report.

Test Results (30~1000MHz)

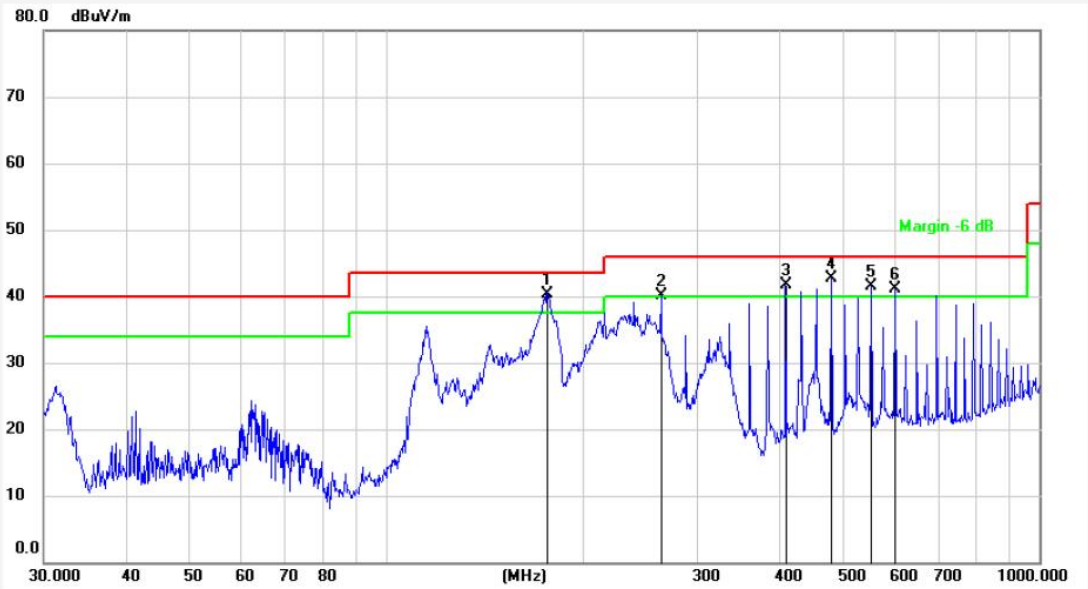
Test Mode: Mode 1

Test Model: AQ-S

Power Source: AC 120V, 60Hz for adapter 1

Polarization: Horizontal

Temp.(℃)/Hum.(%RH): 24.1℃/48%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	176.8876	63.54	-23.30	40.24	43.50	-3.26	QP			
2	263.8190	60.41	-20.30	40.11	46.00	-5.89	QP			
3	408.9460	57.65	-16.02	41.63	46.00	-4.37	QP			
4	480.5276	57.22	-14.43	42.79	46.00	-3.21	QP			
5	552.8832	53.20	-11.69	41.51	46.00	-4.49	QP			
6	601.4265	51.64	-10.53	41.11	46.00	-4.89	QP			

Test Results (30~1000MHz)

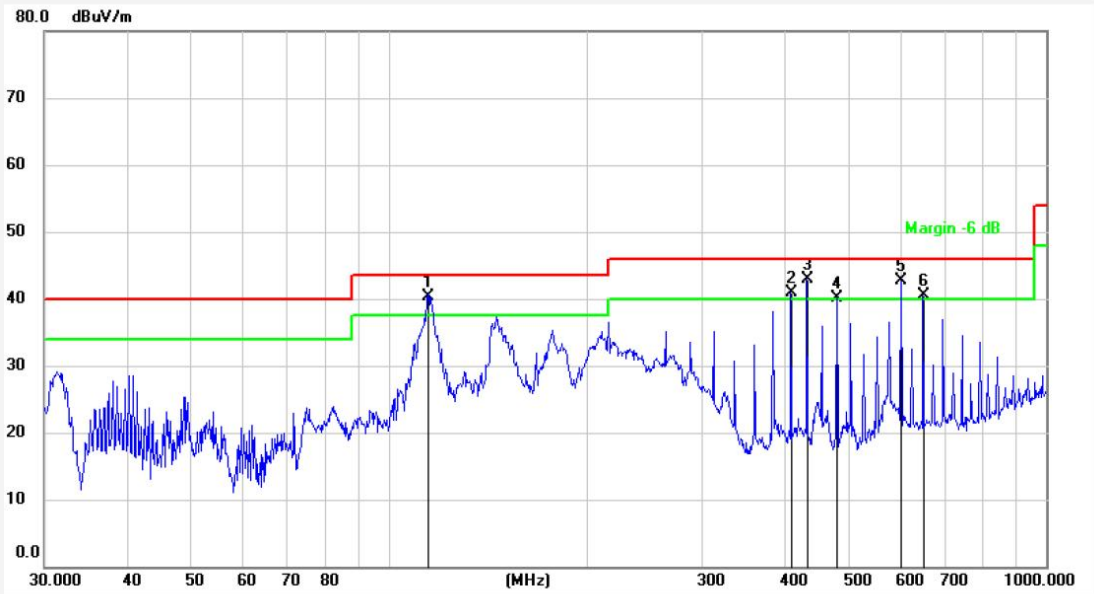
Test Mode: Mode 1

Test Model: AQ-S

Power Source: AC 120V, 60Hz for adapter 1

Polarization: Vertical

Temp.(℃)/Hum.(%RH): 24.1℃/48%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	114.9167	59.31	-19.05	40.26	43.50	-3.24	QP			
2	408.9460	55.13	-14.30	40.83	46.00	-5.17	QP			
3	432.5457	56.77	-13.95	42.82	46.00	-3.18	QP			
4	480.5276	52.99	-12.79	40.20	46.00	-5.80	QP			
5	601.4265	53.26	-10.53	42.73	46.00	-3.27	QP			
6	649.6597	51.12	-10.67	40.45	46.00	-5.55	QP			

Test Results (30~1000MHz)

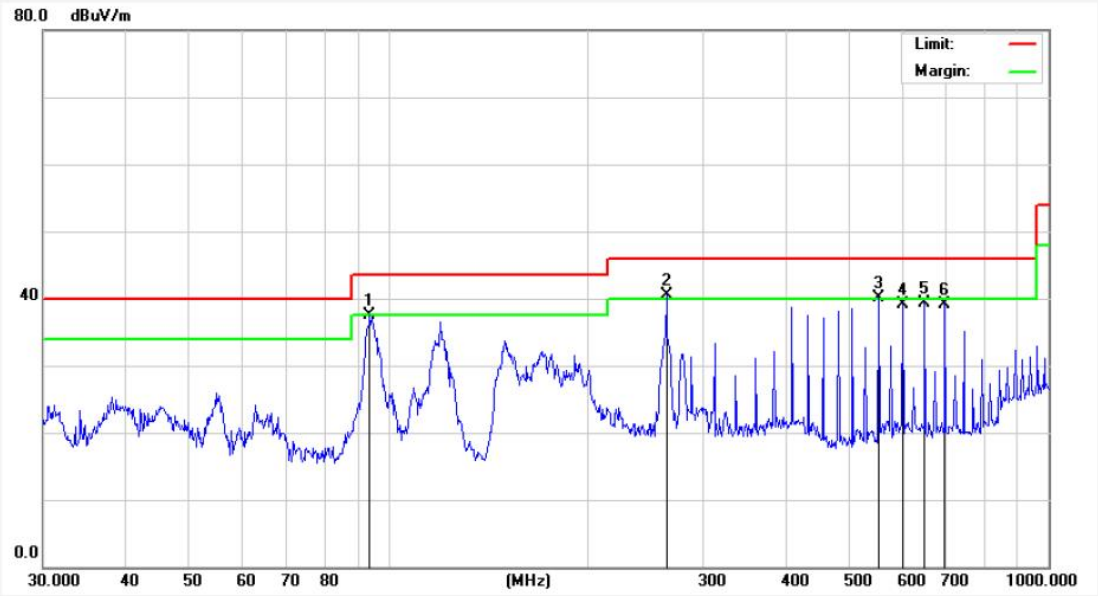
Test Mode: Mode 1

Test Model: AQ-X

Power Source: AC 120V, 60Hz for adapter 2

Polarization: Horizontal

Temp.(℃)/Hum.(%RH): 24.1℃/48%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	93.7685	59.41	-21.90	37.51	43.50	-5.99	QP			
2	263.8190	60.71	-20.30	40.41	46.00	-5.59	QP			
3	552.8831	51.81	-11.69	40.12	46.00	-5.88	QP			
4	601.4265	49.69	-10.53	39.16	46.00	-6.84	QP			
5	649.6597	50.01	-10.67	39.34	46.00	-6.66	QP			
6	696.8567	49.15	-9.95	39.20	46.00	-6.80	QP			

Test Results (30~1000MHz)

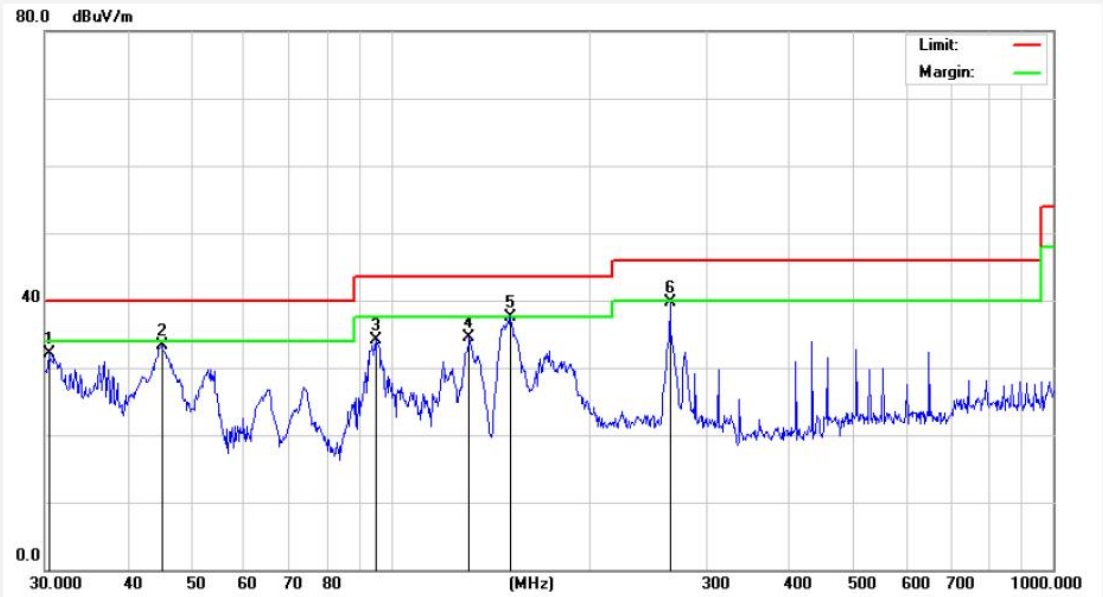
Test Mode: Mode 1

Test Model: AQ-X

Power Source: AC 120V, 60Hz for adapter 2

Polarization: Vertical

Temp.(℃)/Hum.(%RH): 24.1℃/48%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	30.4237	49.90	-17.89	32.01	40.00	-7.99	QP			
2	45.0583	48.33	-15.06	33.27	40.00	-6.73	QP			
3	95.0930	51.25	-17.21	34.04	43.50	-9.46	QP			
4	131.2965	56.02	-21.56	34.46	43.50	-9.04	QP			
5	151.5971	59.53	-22.02	37.51	43.50	-5.99	QP			
6	263.8190	57.22	-17.47	39.75	46.00	-6.25	QP			

For Model: AQ-S

Test Results (1GHz-25GHz)

Test Mode: CH00	Test channel: Lowest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4804.00	29.13	15.27	44.40	74.00	-29.60	Vertical
7206.00	29.08	18.09	47.17	74.00	-26.83	Vertical
9608.00	30.16	23.76	53.92	74.00	-20.08	Vertical
12010.00	*			74.00		Vertical
14412.00	*			74.00		Vertical
4804.00	28.74	15.27	44.01	74.00	-29.99	Horizontal
7206.00	29.86	18.09	47.95	74.00	-26.05	Horizontal
9608.00	28.40	23.76	52.16	74.00	-21.84	Horizontal
12010.00	*			74.00		Horizontal
14412.00	*			74.00		Horizontal

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4804.00	17.40	15.27	32.67	54.00	-21.33	Vertical
7206.00	18.13	18.09	36.22	54.00	-17.78	Vertical
9608.00	19.63	23.76	43.39	54.00	-10.61	Vertical
12010.00	*			54.00		Vertical
14412.00	*			54.00		Vertical
4804.00	17.07	15.27	32.34	54.00	-21.66	Horizontal
7206.00	18.89	18.09	36.98	54.00	-17.02	Horizontal
9608.00	17.91	23.76	41.67	54.00	-12.33	Horizontal
12010.00	*			54.00		Horizontal
14412.00	*			54.00		Horizontal

Test Results (1GHz-25GHz)

Test Mode: CH19	Test channel: Middle

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4880.00	28.68	15.42	44.10	74.00	-29.90	Vertical
7320.00	29.05	18.02	47.07	74.00	-26.93	Vertical
9760.00	29.66	23.80	53.46	74.00	-20.54	Vertical
12200.00	*			74.00		Vertical
14640.00	*			74.00		Vertical
4880.00	28.55	15.42	43.97	74.00	-30.03	Horizontal
7320.00	29.73	18.02	47.75	74.00	-26.25	Horizontal
9760.00	28.12	23.80	51.92	74.00	-22.08	Horizontal
12200.00	*			74.00		Horizontal
14640.00	*			74.00		Horizontal

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	
4880.00	17.49	15.42	32.91	54.00	-21.09	polarization
7320.00	17.99	18.02	36.01	54.00	-17.99	Vertical
9760.00	19.48	23.80	43.28	54.00	-10.72	Vertical
12200.00	*			54.00		Vertical
14640.00	*			54.00		Vertical
4880.00	17.18	15.42	32.60	54.00	-21.40	Vertical
7320.00	19.24	18.02	37.26	54.00	-16.74	Horizontal
9760.00	18.21	23.80	42.01	54.00	-11.99	Horizontal
12200.00	*			54.00		Horizontal
14640.00	*			54.00		Horizontal

Test Results (1GHz-25GHz)

Test Mode: CH39	Test channel: Highest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4960.00	28.81	15.58	44.39	74.00	-29.61	Vertical
7440.00	29.21	17.93	47.14	74.00	-26.86	Vertical
9920.00	30.36	23.83	54.19	74.00	-19.81	Vertical
12400.00	*			74.00		Vertical
14880.00	*			74.00		Vertical
4960.00	28.69	15.58	44.27	74.00	-29.73	Horizontal
7440.00	29.94	17.93	47.87	74.00	-26.13	Horizontal
9920.00	28.50	23.83	52.33	74.00	-21.67	Horizontal
12400.00	*			74.00		Horizontal
14880.00	*			74.00		Horizontal

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4960.00	18.61	15.58	34.19	54.00	-19.81	Vertical
7440.00	19.26	17.93	37.19	54.00	-16.81	Vertical
9920.00	20.13	23.83	43.96	54.00	-10.04	Vertical
12400.00	*			54.00		Vertical
14880.00	*			54.00		Vertical
4960.00	18.36	15.58	33.94	54.00	-20.06	Horizontal
7440.00	20.04	17.93	37.97	54.00	-16.03	Horizontal
9920.00	18.36	23.83	42.19	54.00	-11.81	Horizontal
12400.00	*			54.00		Horizontal
14880.00	*			54.00		Horizontal

Remark:

1.Result =Reading + Factor

2. “*” means the test results were attenuated more than 20dB below the permissible limits, so the results don't record in the report.

3. During the test, pre-scan the BLE_1M&BLE_2M, and found the BLE_1M is worse case, the report only record this mode.

For Model: AQ-X

Test Results (1GHz-25GHz)

Test Mode: CH00	Test channel: Lowest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4804.00	28.89	15.27	44.16	74.00	-29.84	Vertical
7206.00	28.88	18.09	46.97	74.00	-27.03	Vertical
9608.00	29.88	23.76	53.64	74.00	-20.36	Vertical
12010.00	*			74.00		Vertical
14412.00	*			74.00		Vertical
4804.00	28.52	15.27	43.79	74.00	-30.21	Horizontal
7206.00	29.57	18.09	47.66	74.00	-26.34	Horizontal
9608.00	28.30	23.76	52.06	74.00	-21.94	Horizontal
12010.00	*			74.00		Horizontal
14412.00	*			74.00		Horizontal

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4804.00	17.16	15.27	32.43	54.00	-21.57	Vertical
7206.00	17.93	18.09	36.02	54.00	-17.98	Vertical
9608.00	19.35	23.76	43.11	54.00	-10.89	Vertical
12010.00	*			54.00		Vertical
14412.00	*			54.00		Vertical
4804.00	16.85	15.27	32.12	54.00	-21.88	Horizontal
7206.00	18.60	18.09	36.69	54.00	-17.31	Horizontal
9608.00	17.81	23.76	41.57	54.00	-12.43	Horizontal
12010.00	*			54.00		Horizontal
14412.00	*			54.00		Horizontal

Test Results (1GHz-25GHz)

Test Mode: CH19	Test channel: Middle

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4880.00	28.44	15.42	43.86	74.00	-30.14	Vertical
7320.00	28.85	18.02	46.87	74.00	-27.13	Vertical
9760.00	29.38	23.80	53.18	74.00	-20.82	Vertical
12200.00	*			74.00		Vertical
14640.00	*			74.00		Vertical
4880.00	28.33	15.42	43.75	74.00	-30.25	Horizontal
7320.00	29.44	18.02	47.46	74.00	-26.54	Horizontal
9760.00	28.02	23.80	51.82	74.00	-22.18	Horizontal
12200.00	*			74.00		Horizontal
14640.00	*			74.00		Horizontal

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	
4880.00	17.25	15.42	32.67	54.00	-21.33	polarization
7320.00	17.79	18.02	35.81	54.00	-18.19	Vertical
9760.00	19.20	23.80	43.00	54.00	-11.00	Vertical
12200.00	*			54.00		Vertical
14640.00	*			54.00		Vertical
4880.00	16.96	15.42	32.38	54.00	-21.62	Vertical
7320.00	18.95	18.02	36.97	54.00	-17.03	Horizontal
9760.00	18.11	23.80	41.91	54.00	-12.09	Horizontal
12200.00	*			54.00		Horizontal
14640.00	*			54.00		Horizontal

Test Results (1GHz-25GHz)

Test Mode: CH39	Test channel: Highest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4960.00	28.57	15.58	44.15	74.00	-29.85	Vertical
7440.00	29.01	17.93	46.94	74.00	-27.06	Vertical
9920.00	30.08	23.83	53.91	74.00	-20.09	Vertical
12400.00	*			74.00		Vertical
14880.00	*			74.00		Vertical
4960.00	28.47	15.58	44.05	74.00	-29.95	Horizontal
7440.00	29.65	17.93	47.58	74.00	-26.42	Horizontal
9920.00	28.40	23.83	52.23	74.00	-21.77	Horizontal
12400.00	*			74.00		Horizontal
14880.00	*			74.00		Horizontal

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4960.00	18.37	15.58	33.95	54.00	-20.05	Vertical
7440.00	19.06	17.93	36.99	54.00	-17.01	Vertical
9920.00	19.85	23.83	43.68	54.00	-10.32	Vertical
12400.00	*			54.00		Vertical
14880.00	*			54.00		Vertical
4960.00	18.14	15.58	33.72	54.00	-20.28	Horizontal
7440.00	19.75	17.93	37.68	54.00	-16.32	Horizontal
9920.00	18.26	23.83	42.09	54.00	-11.91	Horizontal
12400.00	*			54.00		Horizontal
14880.00	*			54.00		Horizontal

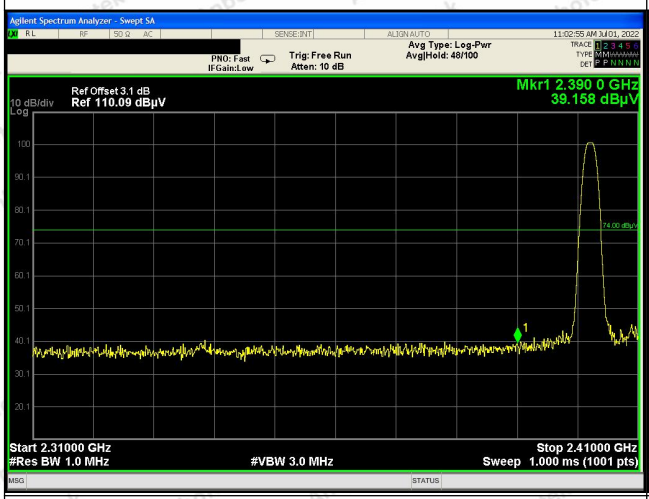
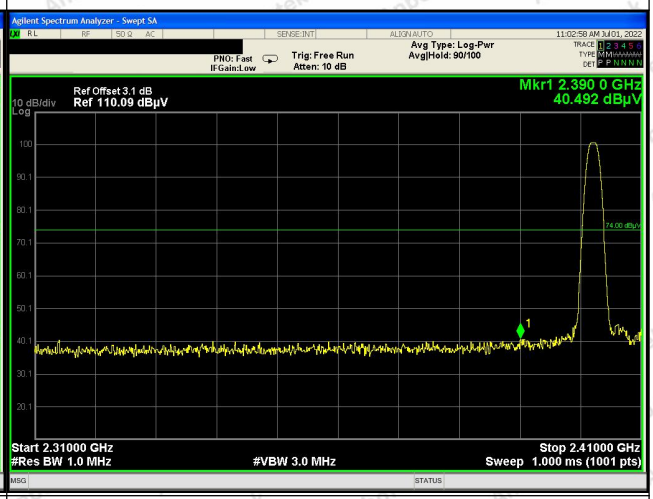
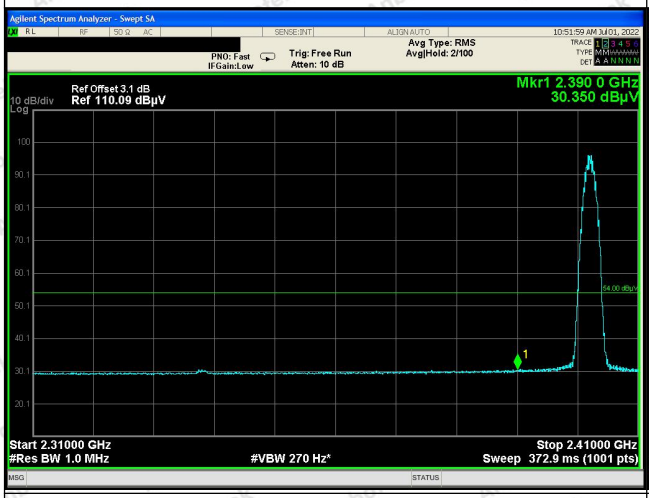
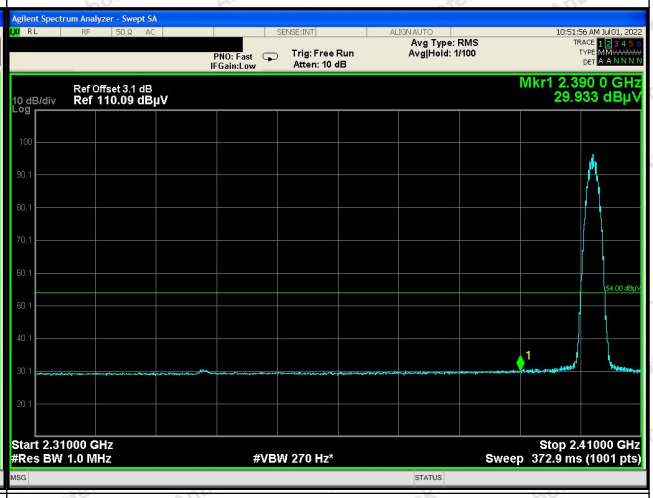
Remark:

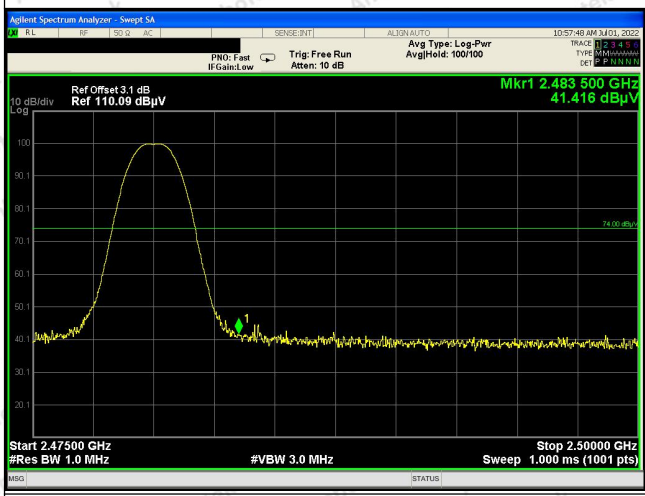
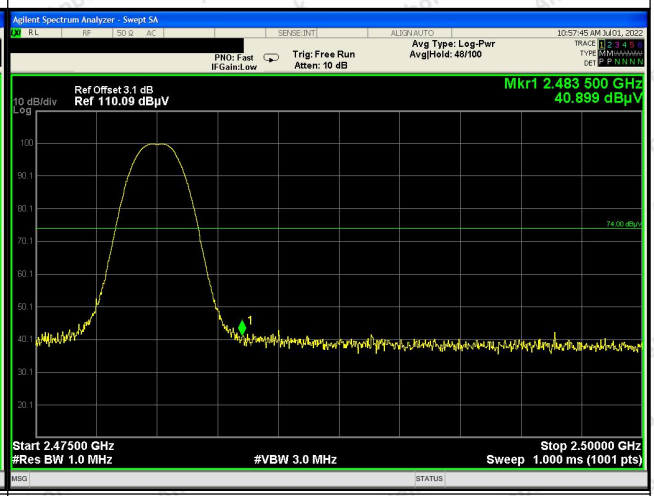
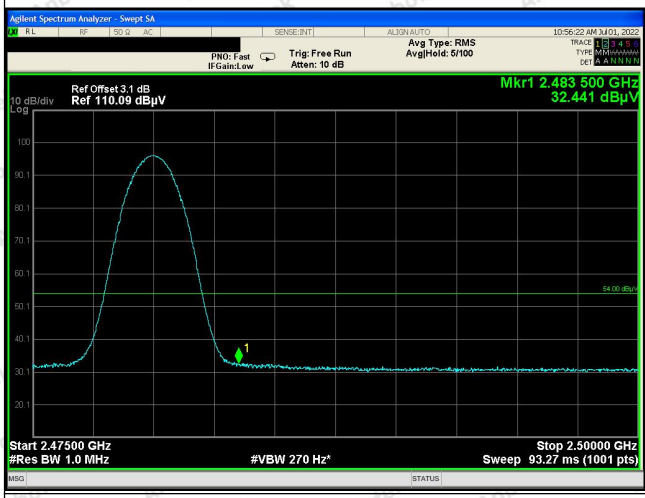
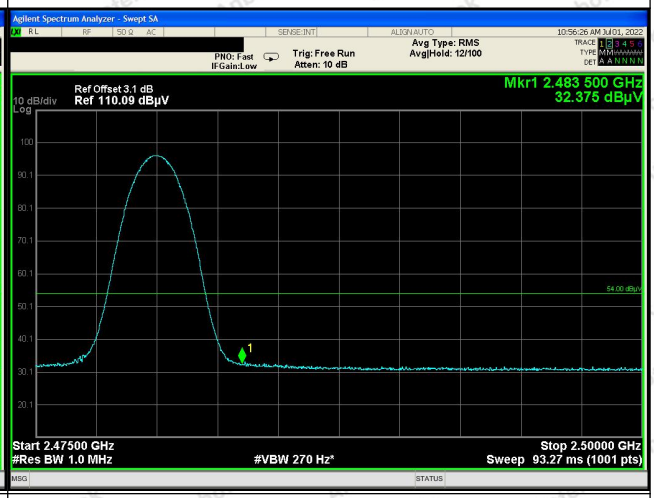
1.Result =Reading + Factor

2. “*” means the test results were attenuated more than 20dB below the permissible limits, so the results don't record in the report.

3. During the test, pre-scan the BLE_1M&BLE_2M, and found the BLE_1M is worse case, the report only record this mode.

Radiated Band Edge:

Test Mode: CH00	Test channel: Lowest
	
Peak Value(Vertical)	Peak Value(Horizontal)
	
Average Value(Vertical)	Average Value(Horizontal)

Test Mode: CH39	Test channel: Highest
	
Peak Value(Vertical)	Peak Value(Horizontal)
	
Average Value(Vertical)	Average Value(Horizontal)

Remark:

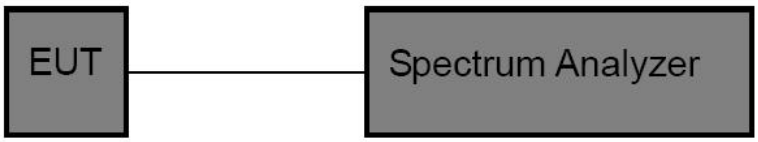
1.During the test, pre-scan the BLE_1M&BLE_2M, and found the BLE_1M is worse case, the report only record this mode.

5. Maximum Peak Output Power Test

5.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (b)(3)
Test Limit	30dBm

5.2. Test Setup



5.3. Test Procedure

This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

1. Set the RBW ≥DTS bandwidth.
2. Set the VBW≥3*RBW.
3. Set the span≥ 3*RBW.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use peak marker function to determine the peak amplitude level.

5.4. Test Data

Pass

Please refer to Appendix C of the Appendix Test Data.

Additional test for duty cycle.

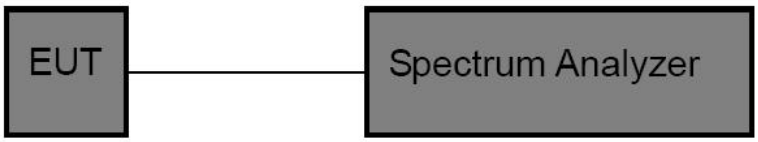
Please refer to Appendix G of the Appendix Test Data.

6. 6DB Occupy Bandwidth Test

6.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (a)(2)
Test Limit	>500kHz

6.2. Test Setup



6.3. Test Procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as:

RBW = 100kHz, VBW≥3*RBW =300kHz,
Detector= Peak
Trace mode= Max hold.
Sweep- auto couple.

4. Mark the peak frequency and –6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

6.4. Test Data

Pass

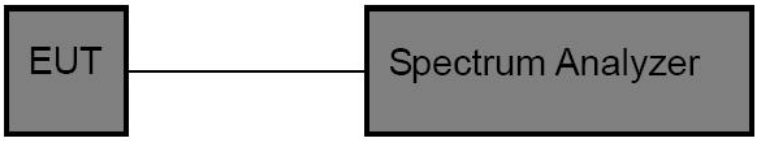
Please refer to Appendix A of the Appendix Test Data.

7. Power Spectral Density Test

7.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (e)
Test Limit	8dBm/3KHz

7.2. Test Setup



7.3. Test Procedure

1. Place the EUT on the table and set it in transmitting mode. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 3kHz, VBW = 10kHz, Span = 1.5xDTS BW
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

7.4. Test Data

Pass

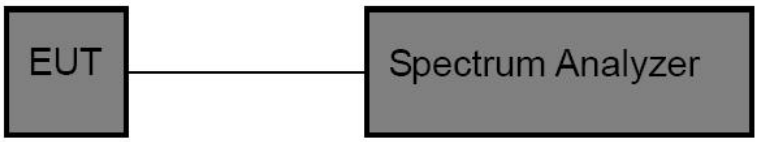
Please refer to Appendix D of the Appendix Test Data.

8. 100kHz Bandwidth of Frequency Band Edge Requirement

8.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (d)
Test Limit	in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in15.209(a).

8.2. Test Setup



8.3. Test Procedure

Using the following spectrum analyzer setting:

1. Set the RBW = 100KHz.
2. Set the VBW = 300KHz.
3. Sweep time = auto couple.
4. Detector function = peak.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.

8.4. Test Data

Pass

Please refer to Appendix E&F of the Appendix Test Data.

9. Antenna Requirement

9.1. Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203 /247(c)
Requirement	1) 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. 2) 15.247(c) (1)(i) requirement: Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

9.2. Antenna Connected Construction

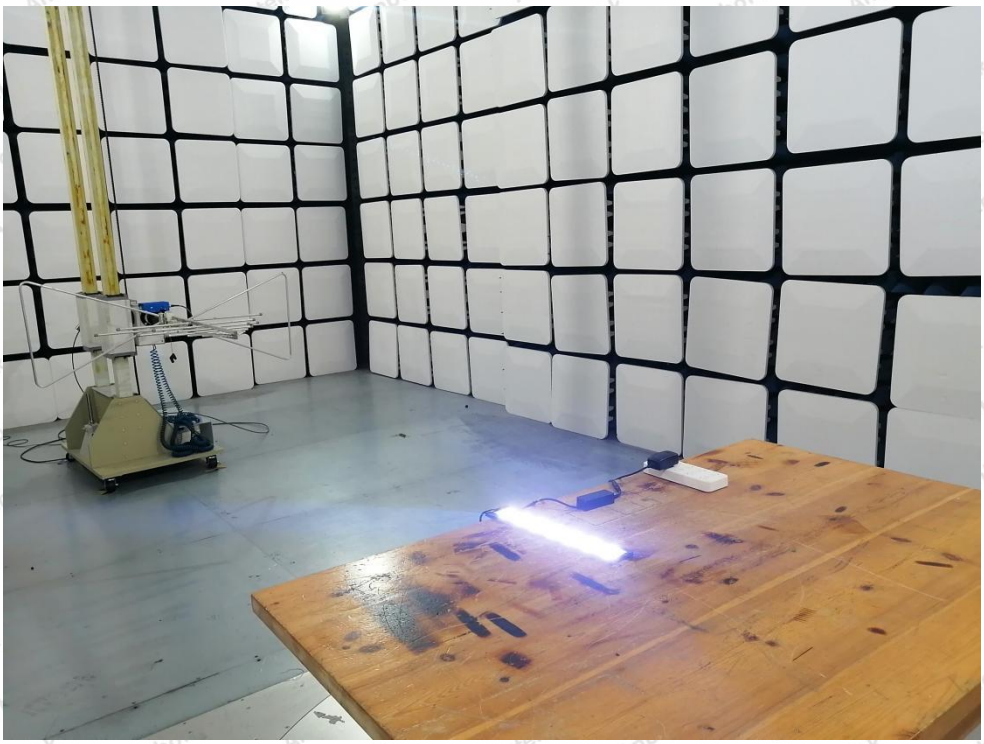
The antenna is a PCB antenna which permanently attached, and the best case gain of the antenna is 2dBi . It complies with the standard requirement.

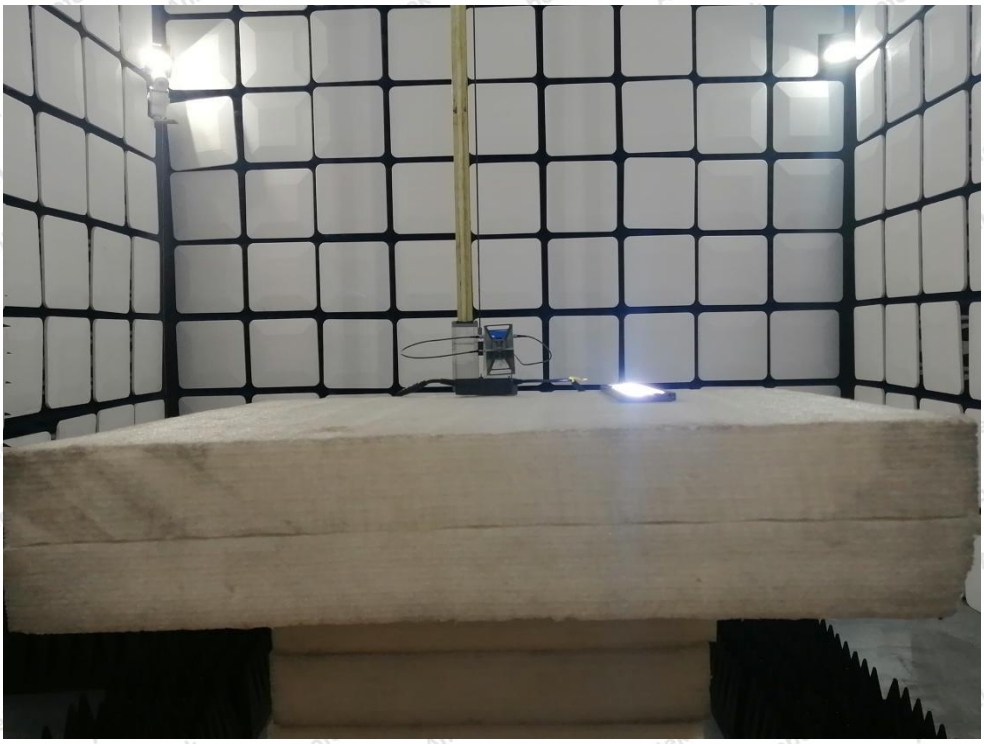
APPENDIX I -- TEST SETUP PHOTOGRAPH

AQ-S with Adapter 1

Photo of Conducted Emission Measurement

Photo of Radiation Emission Test

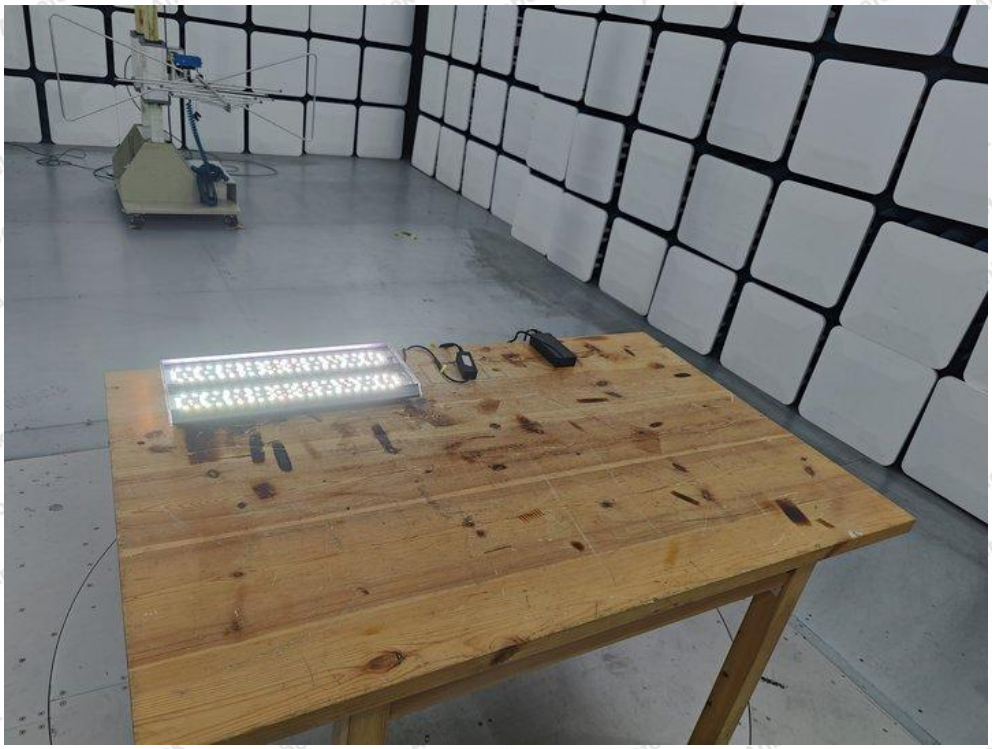




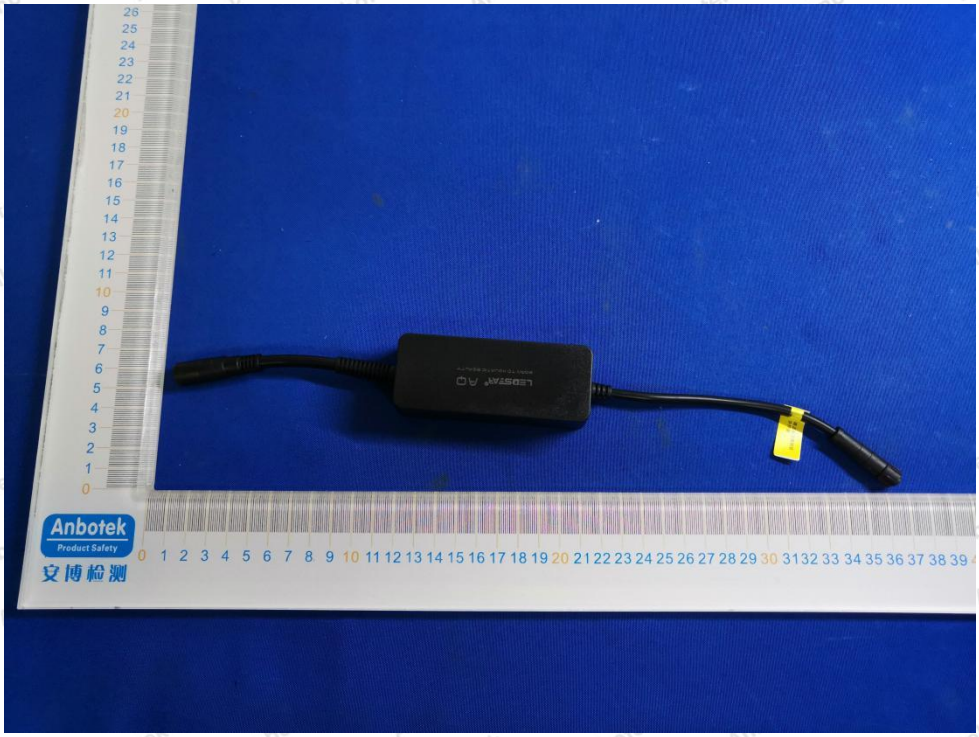
AQ-X with Adapter 2

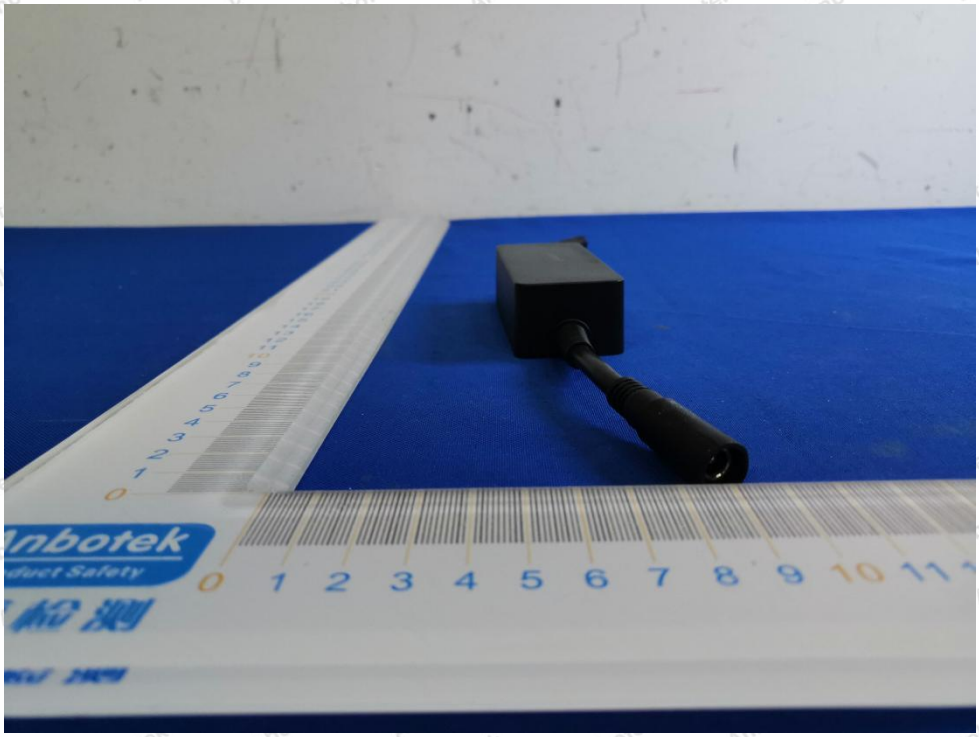
Photo of Conducted Emission Measurement

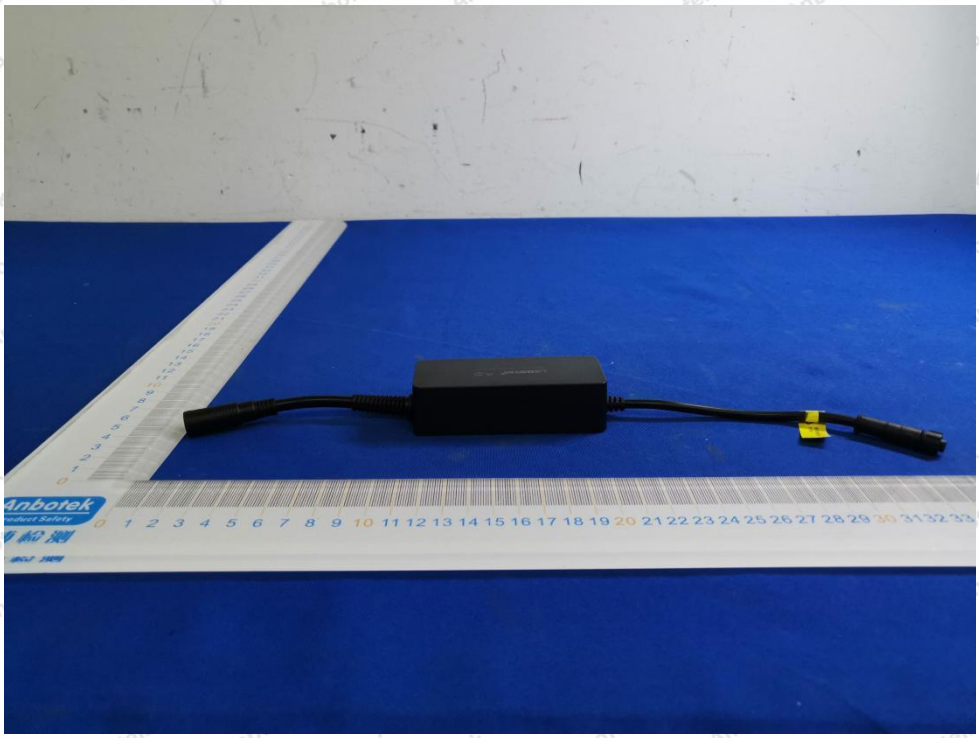
Photo of Radiation Emission Test

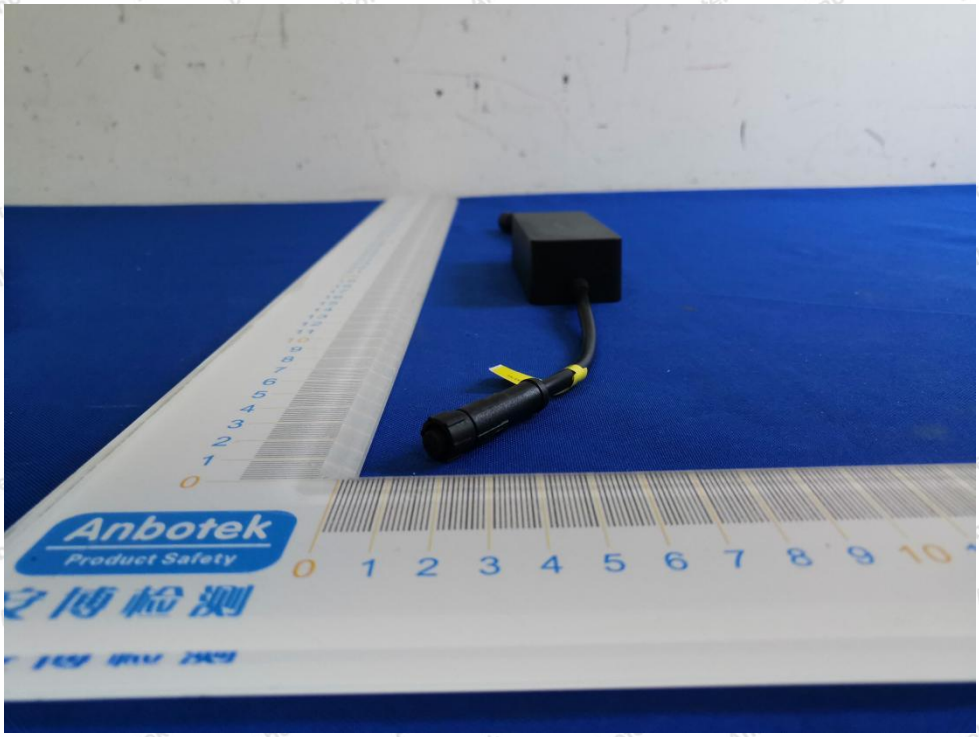


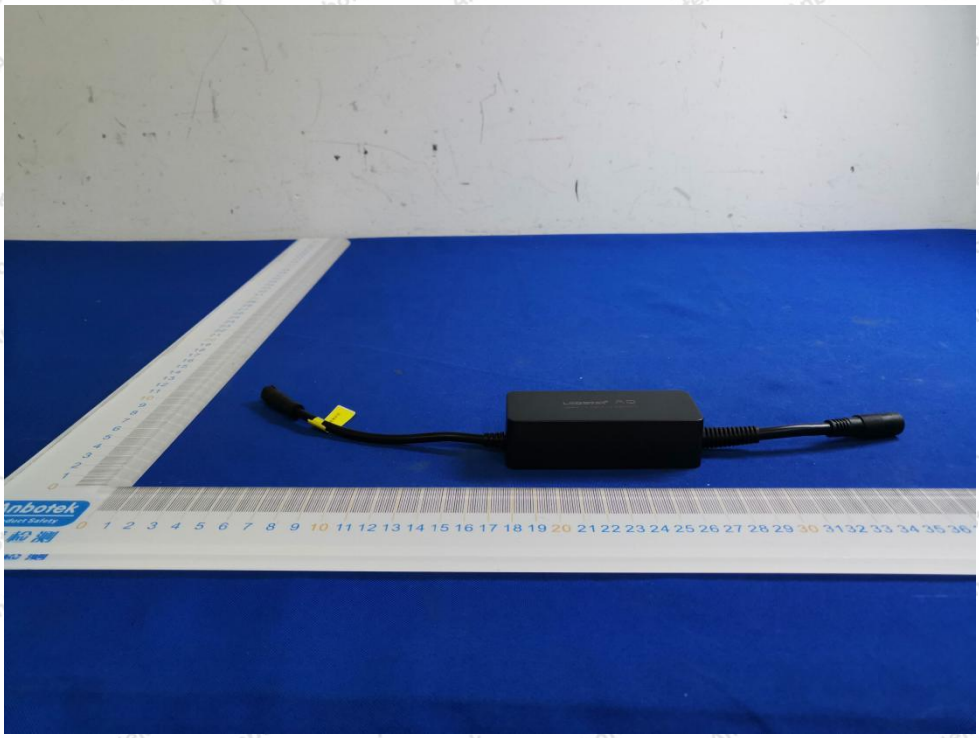
APPENDIX II -- EXTERNAL PHOTOGRAPH





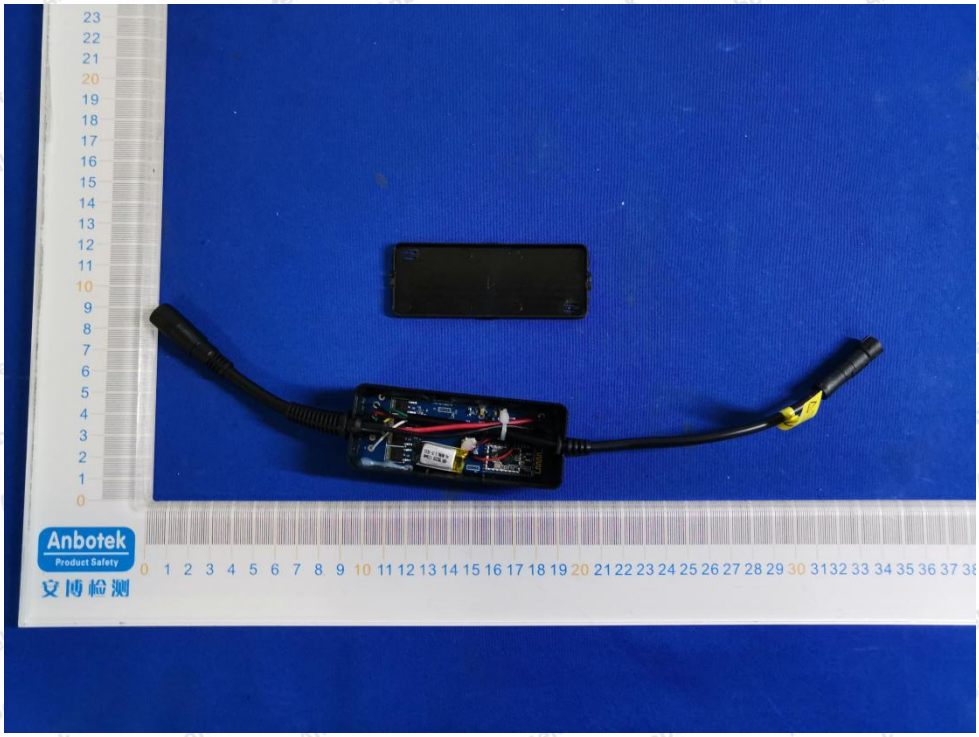


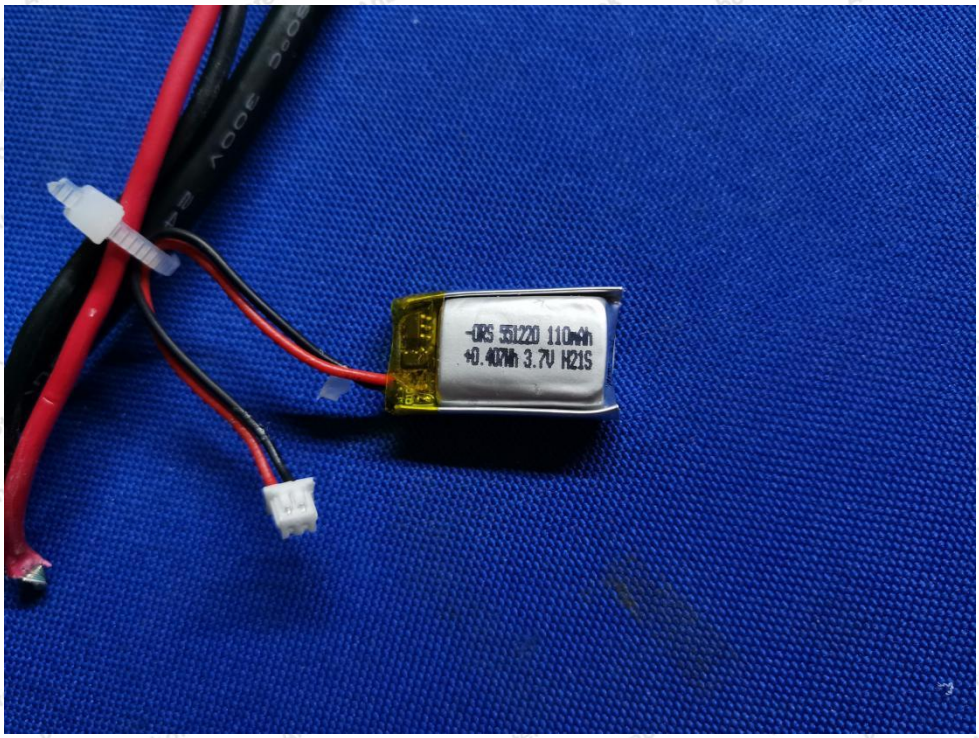

Anbotek
Product Safety

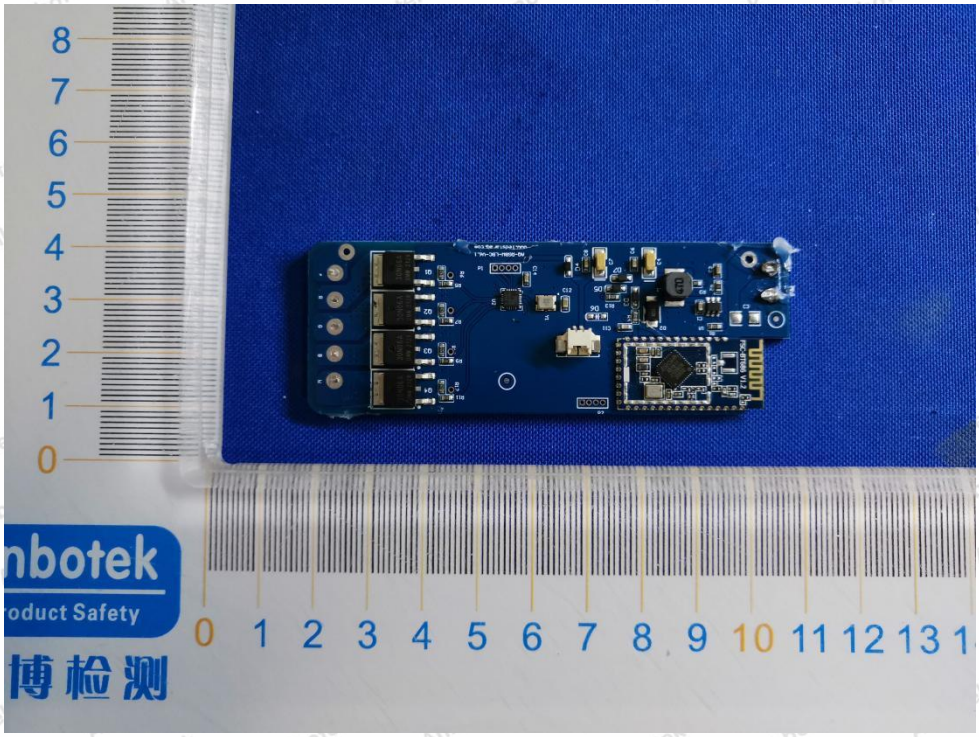


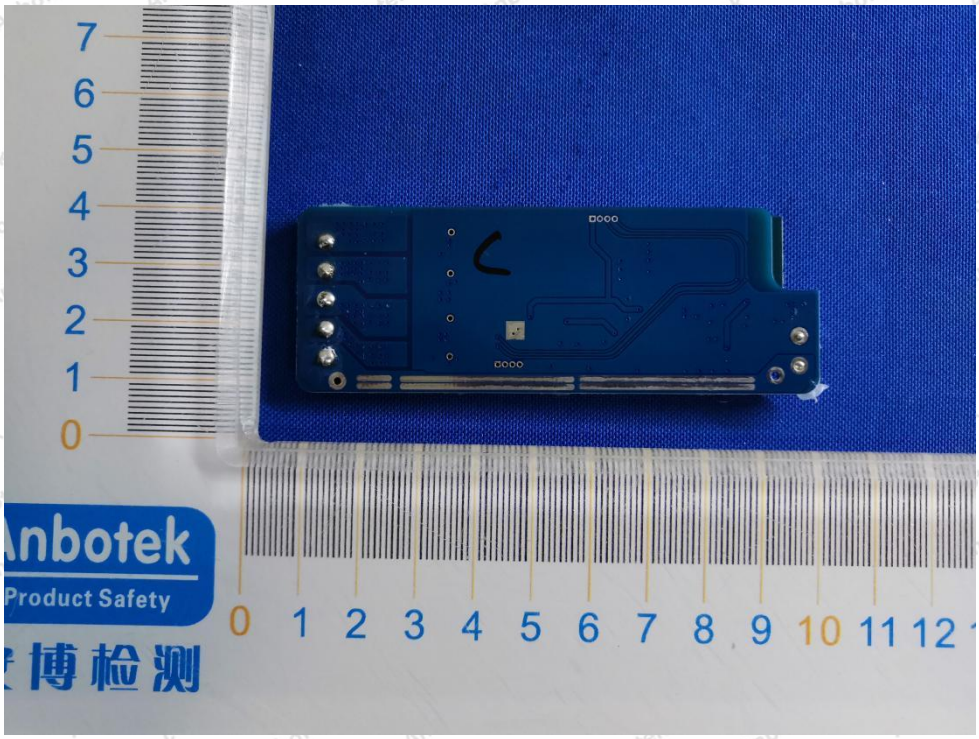
AC/DC ADAPTER
MODEL(型号):GM152-3600430-F
INPUT(输入):
100-240V~50/60Hz 2.5A
OUTPUT(输出):
36.0V⎓4.3A;154.8W
EFFICIENCY LEVEL
CAUTION/ACHTUNG/警告:
CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN
MADE IN CHINA/中国制造
SN:A2104443915

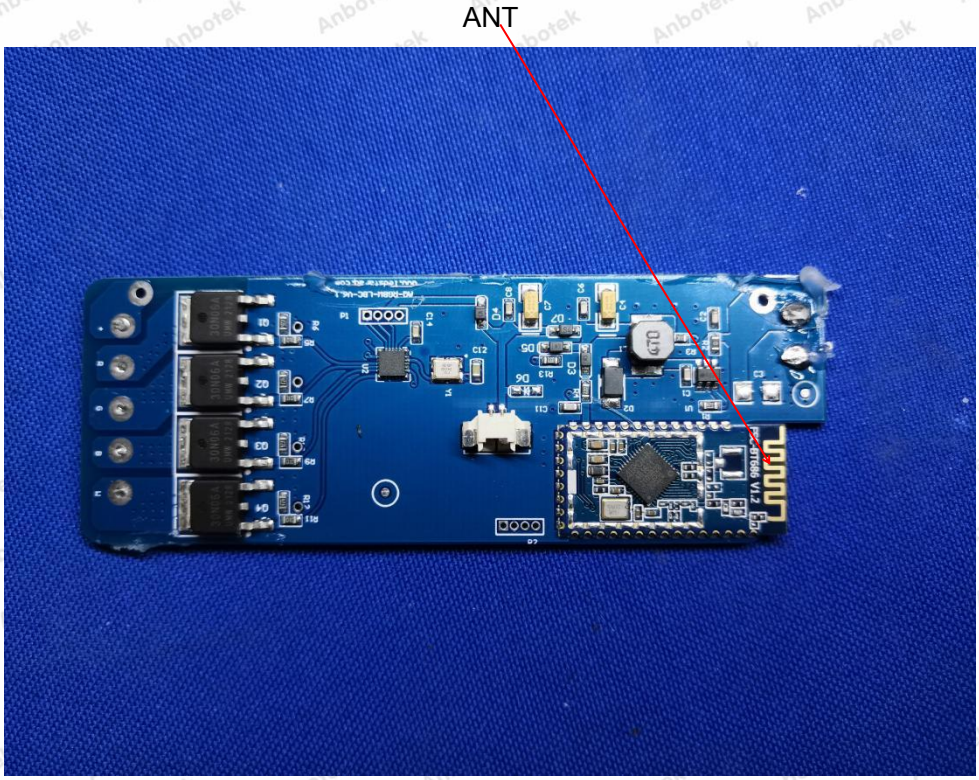
APPENDIX III -- INTERNAL PHOTOGRAPH

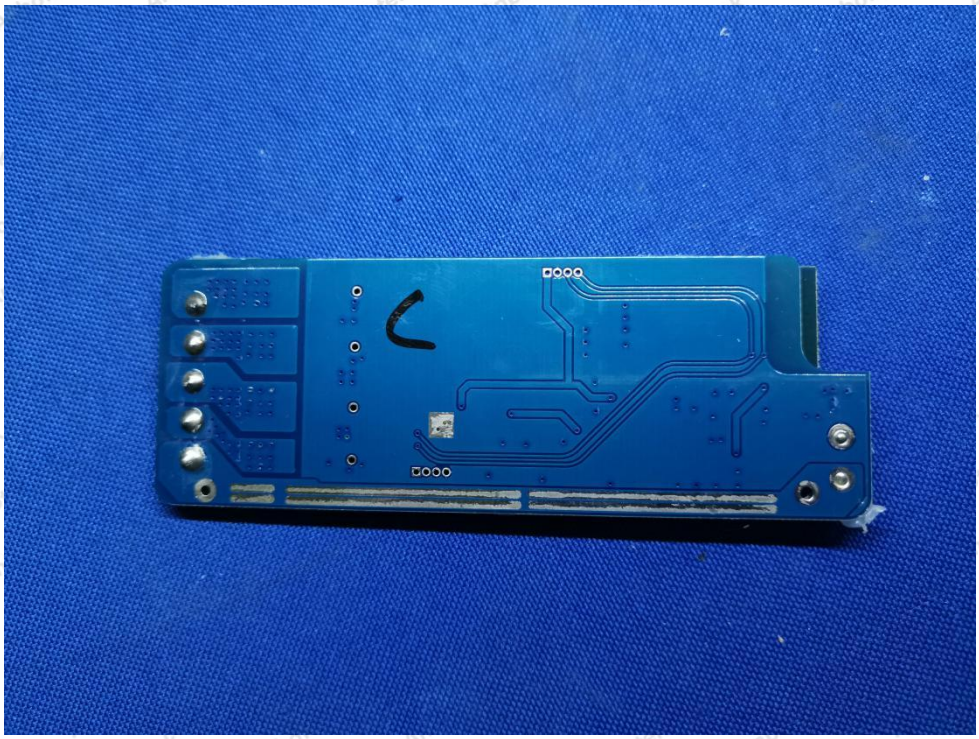









ANT



APPENDIX IV – Appendix Test Data