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TEST REPORT

FCC PART 15 SUBPART C 15.247

Report Reference No. : **CTL2402267012-WF01**

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Product Name	Robotic Pool Cleaner
Model/Type reference	Aiper Scuba S1 Pro
List Model(s)	Aiper Scuba N1 Pro, Aiper Scuba N1 Ultra
Trade Mark	Aiper
FCC ID	2BD5N-S1N1PRO
Applicant's name	Shenzhen Aiper Intelligent Co.,Ltd.
Address of applicant	32nd floor, Block C, Phase 2 Galaxy World, Minle community, Minzhi street, Longhua district, Shenzhen, China
Test Firm	Shenzhen CTL Testing Technology Co., Ltd.
Address of Test Firm	Zone A, 1st Floor, Warehouse 2, Baisha Logistics Company, No. 3011 Shahe West Road, Nanshan District, Shenzhen
Test specification	
Standard	FCC Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
TRF Originator	Shenzhen CTL Testing Technology Co., Ltd.
Master TRF	Dated 2011-01
Date of receipt of test item	Feb. 26, 2024
Date of Test Date	Feb. 26, 2024- April 27, 2024
Date of Issue	April 28, 2024
Result	Pass

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TEST REPORT

Test Report No. :	CTL2402267012-WF01	April 28, 2024
Date of issue		

Equipment under Test	:	Robotic Pool Cleaner
Sample No	:	CTL2402267012
Model /Type	:	Aiper Scuba S1 Pro
Listed Models	:	Aiper Scuba N1 Pro, Aiper Scuba N1 Ultra
Applicant	:	Shenzhen Aiper Intelligent Co.,Ltd.
Address	:	32nd floor, Block C, Phase 2 Galaxy World, Minle community, Minzhi street, Longhua district, Shenzhen, China
Manufacturer	:	Shenzhen Aiper Intelligent Co.,Ltd.
Address	:	32nd floor, Block C, Phase 2 Galaxy World, Minle community, Minzhi street, Longhua district, Shenzhen, China

Test result	Pass *
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* In the configuration tested, the EUT complied with the standards specified page 5.

The test results presented in this report relate only to the object tested.

This report shall not be reproduced, except in full, without the written approval of the issuing testing laboratory.

** Modified History **

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1. SUMMARY

1.1. TEST STANDARDS

The tests were performed according to following standards:

[FCC Rules Part 15.247](#): Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

[ANSI C63.10: 2013](#): American National Standard for Testing Unlicensed Wireless Devices

[KDB558074 D01 15.247 Meas Guidance v05r02](#): Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

1.2. Test Description

FCC PART 15.247		
FCC Part 15.207	AC Power Conducted Emission	PASS
FCC Part 15.247(a)(2)	6dB Bandwidth	PASS
FCC Part 15.247(d)	Spurious RF Conducted Emission	PASS
FCC Part 15.247(b)	Maximum Peak Conducted Output Power	PASS
FCC Part 15.247(e)	Power Spectral Density	PASS
FCC Part 15.205/ 15.209	Radiated Emissions	PASS
FCC Part 15.247(d)	Band Edge	PASS
FCC Part 15.203/15.247 (b)	Antenna Requirement	PASS

1.3. Test Facility

1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co.,Ltd.

Zone A, 1st Floor, Warehouse 2, Baisha Logistics Company, No. 3011 Shahe West Road, Nanshan District, Shenzhen

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.10 and CISPR 32/EN 55032 requirements.

1.3.2 Laboratory accreditation

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

CNAS-Lab Code: L7497

Shenzhen CTL Testing Technology Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2017 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No. 4343.01

Shenzhen CTL Testing Technology Co., Ltd, EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

IC Registration No.: 9618B

CAB identifier: CN0041

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements with Registration No.: 9618B on Jan. 22, 2019.

FCC-Registration No.: 399832

Designation No.: CN1216

Shenzhen CTL Testing Technology Co., Ltd. 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 399832, December 08, 2017.

1.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CTL laboratory is reported:

Test	Measurement Uncertainty	Notes
Transmitter power Radiated	±2.20 dB	(1)
Radiated Emission 9KHz~30MHz	±3.66dB	(1)
Radiated Emission 30~1000MHz	±4.10dB	(1)
Radiated Emission Above 1GHz	±4.32dB	(1)
DTS Bandwidth	±1.9%	(1)

Maximum Conducted Output Power	± 1.18 dB	(1)
Maximum Power Spectral Density Level	±0.98 dB	(1)
Band-edge	±1.21dB	(1)
Unwanted Emissions In Non-restricted Freq Bands	9kHz-7GHz:±1.09dB 7GHz-26.5GHz: ±3.27dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

2. GENERAL INFORMATION

2.1. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

2.2. General Description of EUT

Product Name:	Robotic Pool Cleaner
Model/Type reference:	Aiper Scuba S1 Pro
List Model(s):	Aiper Scuba N1 Pro, Aiper Scuba N1 Ultra
Model difference:	All models are design based the same main hardware. Aiper Scuba S1 Pro and Aiper Scuba N1 Pro is all the same only the difference of shell colour. Aiper Scuba S1 Pro/Aiper Scuba N1 Pro compare to Aiper Scuba N1 Ultra is difference of appearance, battery capacity and LED strip.
Power supply:	DC 25.2V from battery
Adapter information:	Model:GM94-294300-1FGN Input: 100-240V~ 50/60Hz 2.5A Output:29.4V---3.0A; 88.2W
Hardware version:	V1.4
Software version:	V1.0
Bluetooth LE	
Supported type:	BLE_1M
Modulation:	GFSK
Operation frequency:	2402MHz to 2480MHz
Channel number:	40
Channel separation:	2MHz
Antenna type:	PCB Antenna
Antenna gain:	3.37 dBi

Note1: For more details, please refer to the user's manual of the EUT.

Note2: Antenna gain provided by the applicant.

Note3: According the model differences declared by the applicant, all the differences for each model do not affect the RF performance of the products, and they are electrically equivalent. We test Conducted Emissions and Radiated Emission below 1GHz for Aiper Scuba S1 Pro and Aiper Scuba N1 Ultra, all other test is performed using main model Aiper Scuba S1 Pro.

2.3. Description of Test Modes and Test Frequency

The Applicant provides communication tools software(EspRFTestTool_v3.6) to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing.

There are 40 channels provided to the EUT and Channel 00/19/39 were selected for BLE test.

Operation Frequency List :

Channel	Frequency (MHz)
00	2402
02	2404
03	2406
:	:
19	2440
:	:
37	2476
38	2478
39	2480

Note: The line display in grey were the channel selected for testing

Power setting during the test:

During testing, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Power Parameters:

Test Software Version	EspRFTestTool_v3.6		
Frequency	2402MHz	2440MHz	2480MHz
BLE_1M	default	default	default

2.4. Equipments Used during the Test

Conducted Emission					
Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due
EMI Test Receiver	ROHDE & SCHWARZ	ESCI	1166.5950.03	2023/05/04	2024/05/03
LISN	ROHDE & SCHWARZ	ESH2-Z5	860014/010	2023/05/04	2024/05/03
Limitator	ROHDE & SCHWARZ	ESH3-Z2	100408	2023/05/04	2024/05/03

Software:					
Name of Software:	Version:				
ES-K1	V1.71				

Radiated Emissions					
Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
Active Loop Antenna	Da Ze	ZN30900A	/	2021/05/13	2024/05/12
Double cone logarithmic antenna	Schwarzbeck	VULB 9168	824	2023/02/13	2026/02/12
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2021/12/23	2024/12/22
Horn Antenna	Ocean Microwave	OBH100400	26999002	2021/12/22	2024/12/21
Amplifier	MRT-AP01M06	MRT	S-001	2023/05/04	2024/05/03
Amplifier	Agilent	8449B	3008A02306	2023/05/04	2024/05/03
Amplifier	Brief&Smart	LNA-4018	2104197	2023/05/05	2024/05/04
EMI Test Receiver	ROHDE & SCHWARZ	ESCI	1166.5950.03	2023/05/04	2024/05/03
Spectrum Analyzer	RS	FSP	1164.4391.38	2023/05/05	2024/05/04

Test software					
Name of Software	Version				
EZ_EMC(Below 1GHz)	V1.1.4.2				
EZ_EMC(Above 1GHz)	V1.1.4.2				

RF Conducted					
Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
Spectrum Analyzer	Keysight	N9020A	MY53420874	2023/05/04	2024/05/03
Temperature/Humidity Meter	Ji Yu	MC501	/	2023/05/09	2024/05/08

Test Software					
Name of Software	Version				
TST-PASS	V2.0				

2.5. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.6. Modifications

No modifications were implemented to meet testing criteria.

3. TEST CONDITIONS AND RESULTS

3.1. Conducted Emissions Test

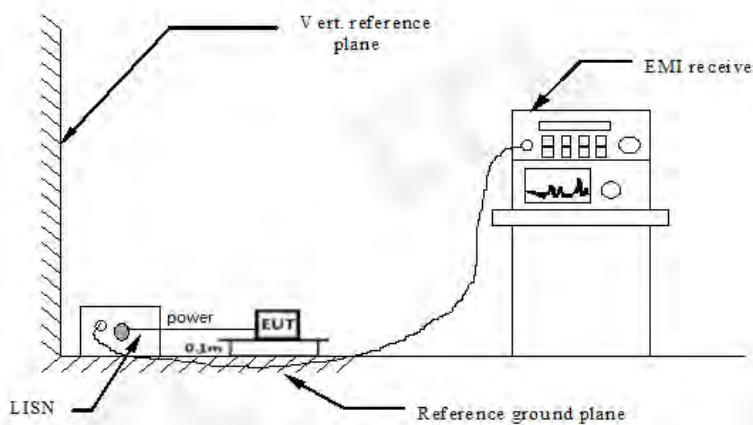
LIMIT

According to FCC CFR Title 47 Part 15 Subpart C Section 15.207, AC Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus as below:

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION



TEST PROCEDURE

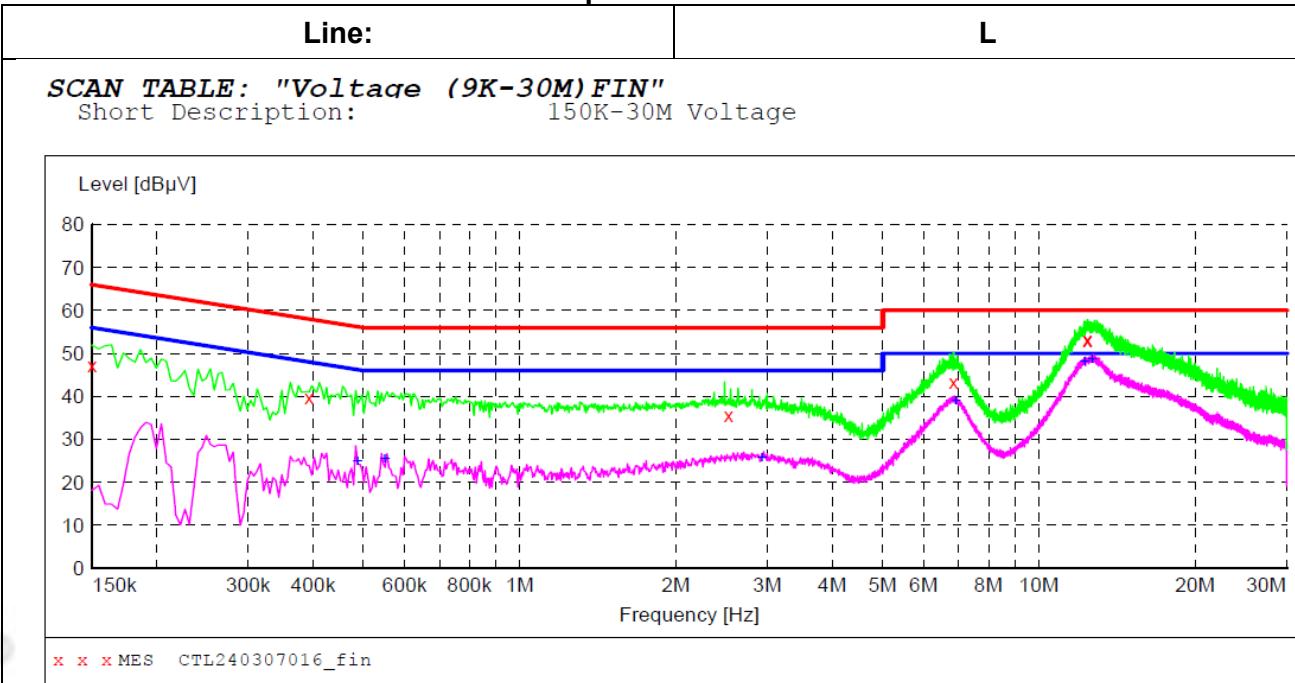
1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.1 meters is used and is placed on the ground plane as per ANSI C63.10:2013.
2. Support equipment, if needed, was placed as per ANSI C63.10:2013.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2013.
4. The adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

TEST RESULTS

Note:

- Both 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz power supply have been tested, only the worst result of 120 VAC, 60 Hz was reported as below:
- All Low, Middle, and High channel has been tested, only the worst BLE 1M Low channel reported.

Model: Aiper Scuba S1 Pro



MEASUREMENT RESULT: "CTL240307016_fin"

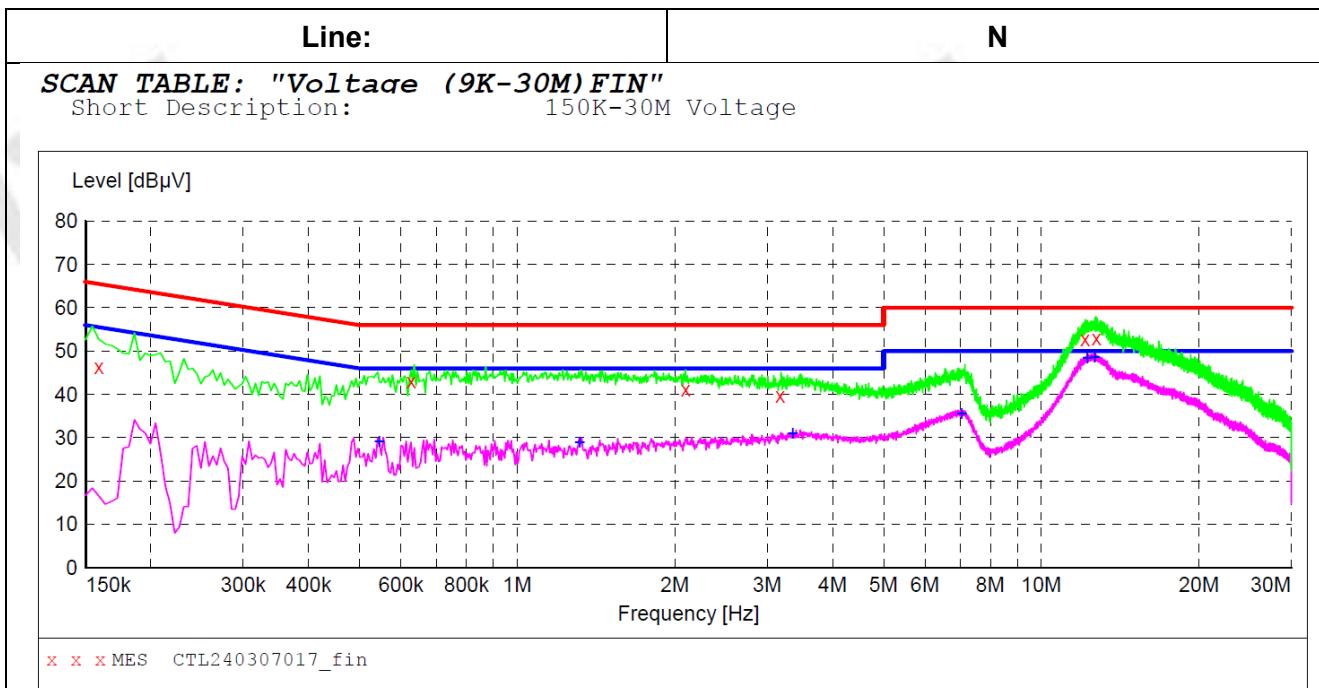
3/7/2024 9:52AM	Frequency	Level	Transd	Limit	Margin	Detector	Line	PE
	MHz	dBμV	dB	dBμV	dB			
	0.150000	47.20	10.0	66	18.8	QP	L1	GND
	0.393000	39.90	10.0	58	18.1	QP	L1	GND
	2.526000	35.60	10.1	56	20.4	QP	L1	GND
	6.841500	43.30	10.3	60	16.7	QP	L1	GND
	12.394500	53.20	10.9	60	6.8	QP	L1	GND
	12.403500	53.00	10.9	60	7.0	QP	L1	GND

MEASUREMENT RESULT: "CTL240307016_fin2"

3/7/2024 9:52AM	Frequency	Level	Transd	Limit	Margin	Detector	Line	PE
	MHz	dBμV	dB	dBμV	dB			
	0.487500	25.00	10.0	46	21.2	AV	L1	GND
	0.550500	25.40	10.0	46	20.6	AV	L1	GND
	2.926500	25.80	10.1	46	20.2	AV	L1	GND
	6.909000	38.90	10.3	50	11.1	AV	L1	GND
	12.259500	48.20	10.9	50	1.8	AV	L1	GND
	12.669000	48.50	10.9	50	1.5	AV	L1	GND

Remark: Level(dBuV)=Reading(dBuV) + Transd.(dB)

Margin=Limit(dBuV)- Level(dBuV)



MEASUREMENT RESULT: "CTL240307017_fin"

3/7/2024 9:55AM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.159000	46.30	10.0	66	19.2	QP	N	GND
0.627000	42.90	10.0	56	13.1	QP	N	GND
2.094000	41.10	10.1	56	14.9	QP	N	GND
3.174000	39.60	10.1	56	16.4	QP	N	GND
12.115500	52.80	10.9	60	7.2	QP	N	GND
12.741000	52.90	10.9	60	7.1	QP	N	GND

MEASUREMENT RESULT: "CTL240307017_fin2"

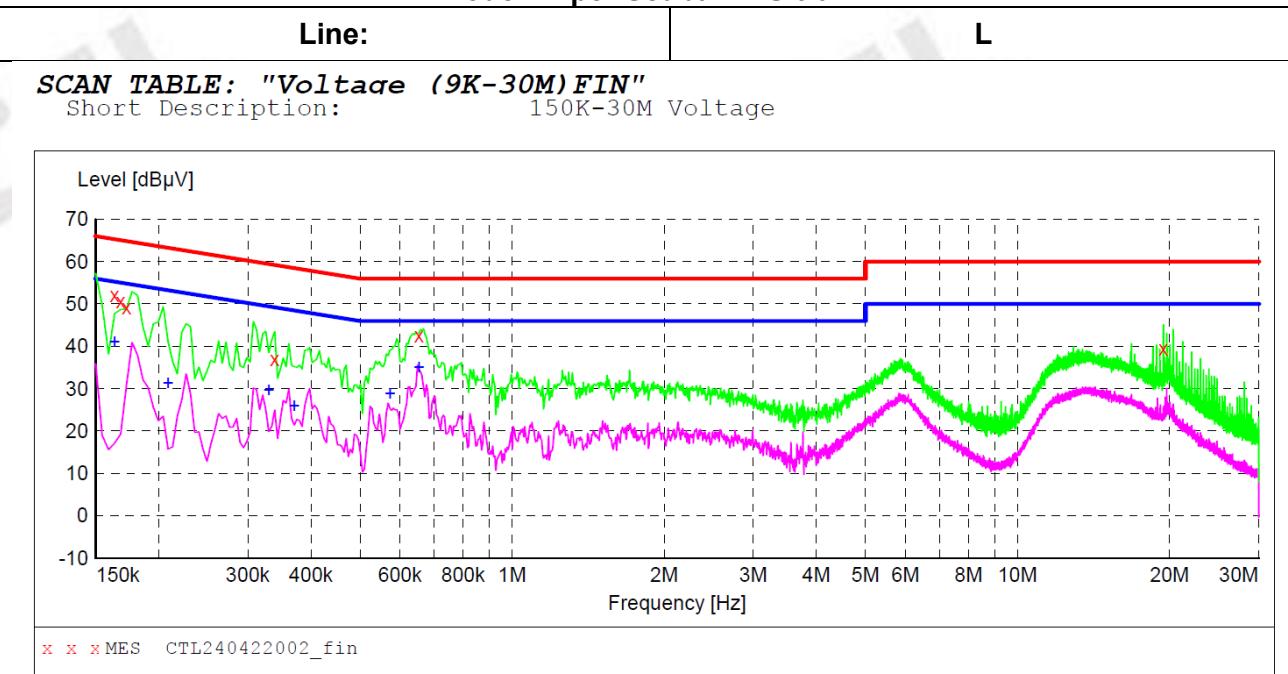
3/7/2024 9:55AM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.546000	29.10	10.0	46	16.9	AV	N	GND
1.315500	28.90	10.1	46	17.1	AV	N	GND
3.358500	31.00	10.1	46	15.0	AV	N	GND
7.048500	35.60	10.3	50	14.4	AV	N	GND
12.241500	48.40	10.9	50	1.6	AV	N	GND
12.642000	48.50	10.9	50	1.5	AV	N	GND

Remark: Level(dBuV)=Reading(dBuV) + Transd.(dB)

Margin=Limit(dBuV)- Level(dBuV)

Model: Aiper Scuba N1 Ultra

**MEASUREMENT RESULT: "CTL240422002_fin"**

4/22/2024 9:20AM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.163500	52.10	10.0	65	13.2	QP	L1	GND
0.168000	50.50	10.0	65	14.6	QP	L1	GND
0.172500	49.10	10.0	65	15.7	QP	L1	GND
0.339000	36.90	10.0	59	22.3	QP	L1	GND
0.654000	42.50	10.0	56	13.5	QP	L1	GND
19.423500	39.50	11.2	60	20.5	QP	L1	GND

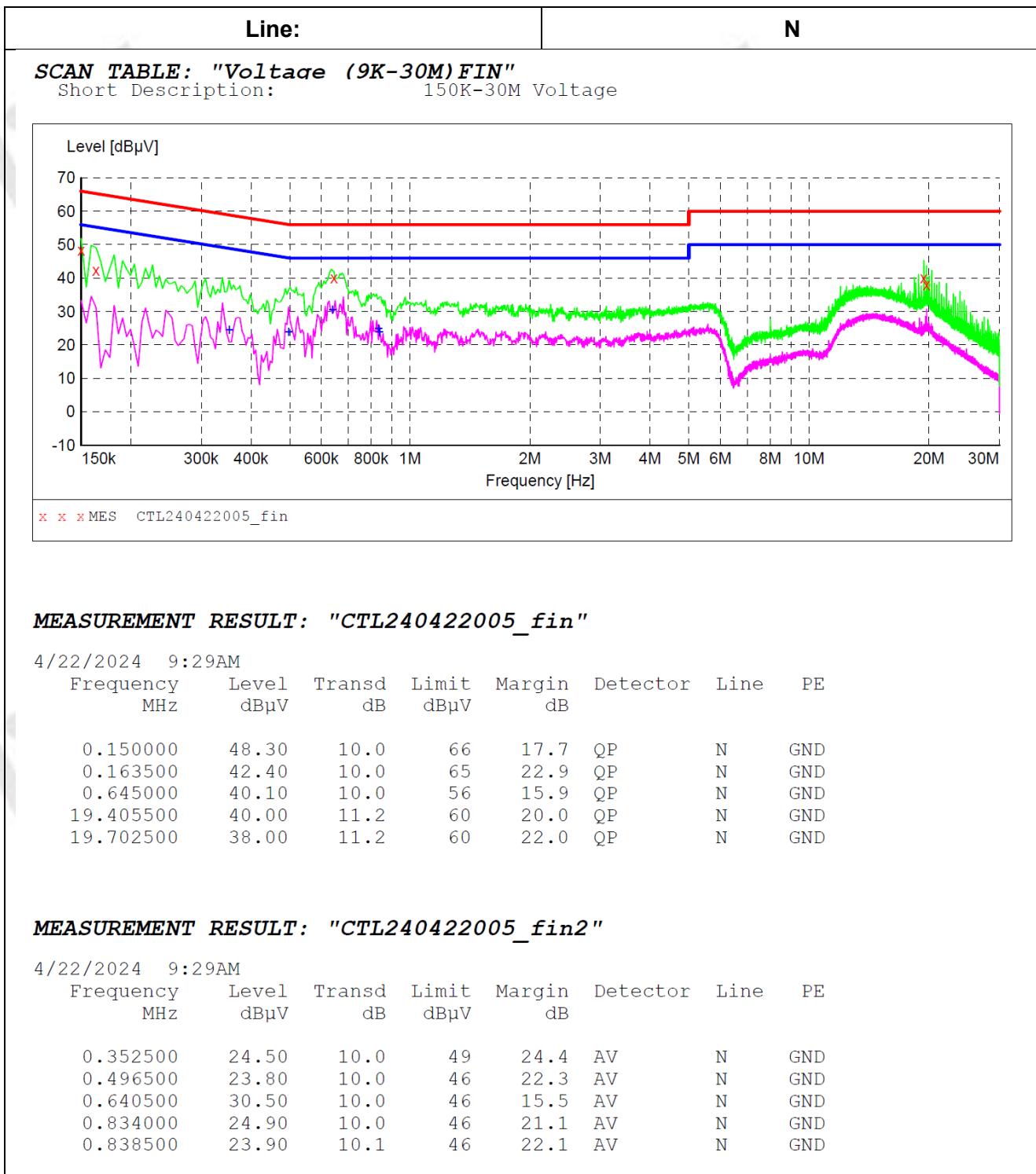
MEASUREMENT RESULT: "CTL240422002_fin2"

4/22/2024 9:20AM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.163500	41.10	10.0	55	14.2	AV	L1	GND
0.208500	31.30	10.0	53	22.0	AV	L1	GND
0.330000	29.80	10.0	50	19.7	AV	L1	GND
0.370500	26.00	10.0	49	22.5	AV	L1	GND
0.573000	28.90	10.0	46	17.1	AV	L1	GND
0.654000	35.00	10.0	46	11.0	AV	L1	GND

Remark: Level(dBuV)=Reading(dBuV) + Transd.(dB)

Margin=Limit(dBuV)- Level(dBuV)



Remark: Level(dBuV)=Reading(dBuV) + Transd.(dB)

Margin=Limit(dBuV)- Level(dBuV)

3.2. Radiated Emissions and Band Edge

Limit

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission out of authorized band shall not exceed the following table at a 3 meters measurement distance.

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 in §15.209(a)

Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in table below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission

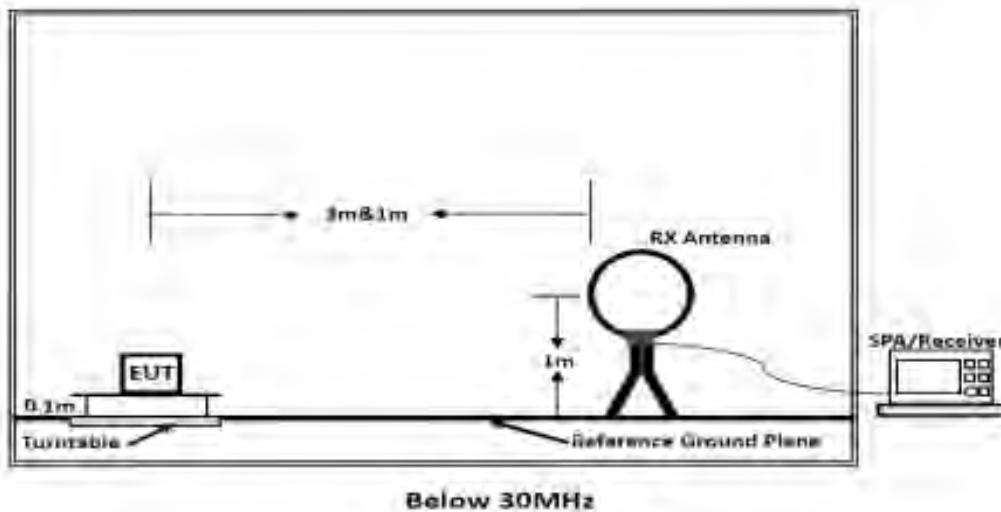
Unwanted emissions that fall into restricted bands shall comply with the limits specified in RSS-Gen; and Unwanted emissions that do not fall within the restricted frequency bands shall comply either with the limits specified in the applicable RSS or with those specified in this RSS-Gen.

Radiated emission limits

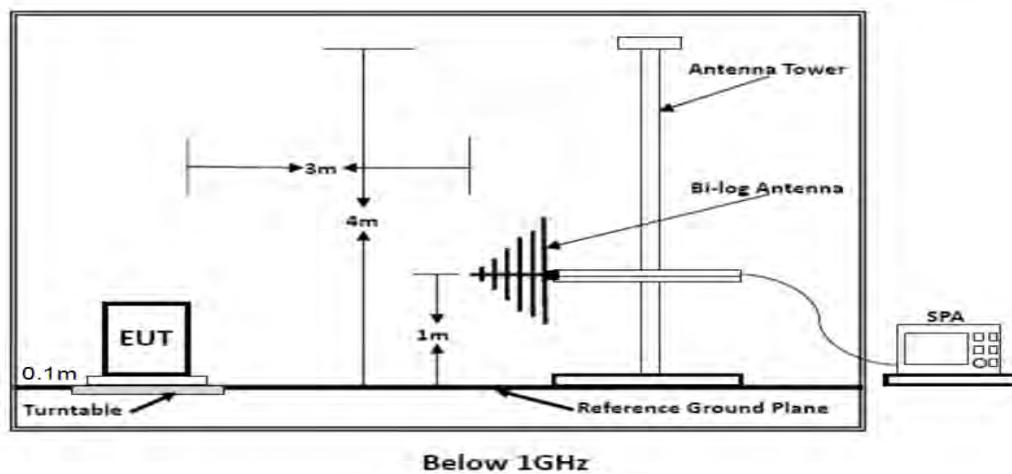
Frequency (MHz)	Distance (Meters)	Radiated (dB μ V/m)	Radiated (μ V/m)
0.009-0.49	3	$20\log(2400/F(\text{KHz}))+40\log(300/3)$	$2400/F(\text{KHz})$
0.49-1.705	3	$20\log(24000/F(\text{KHz}))+40\log(30/3)$	$24000/F(\text{KHz})$
1.705-30	3	$20\log(30)+40\log(30/3)$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST CONFIGURATION

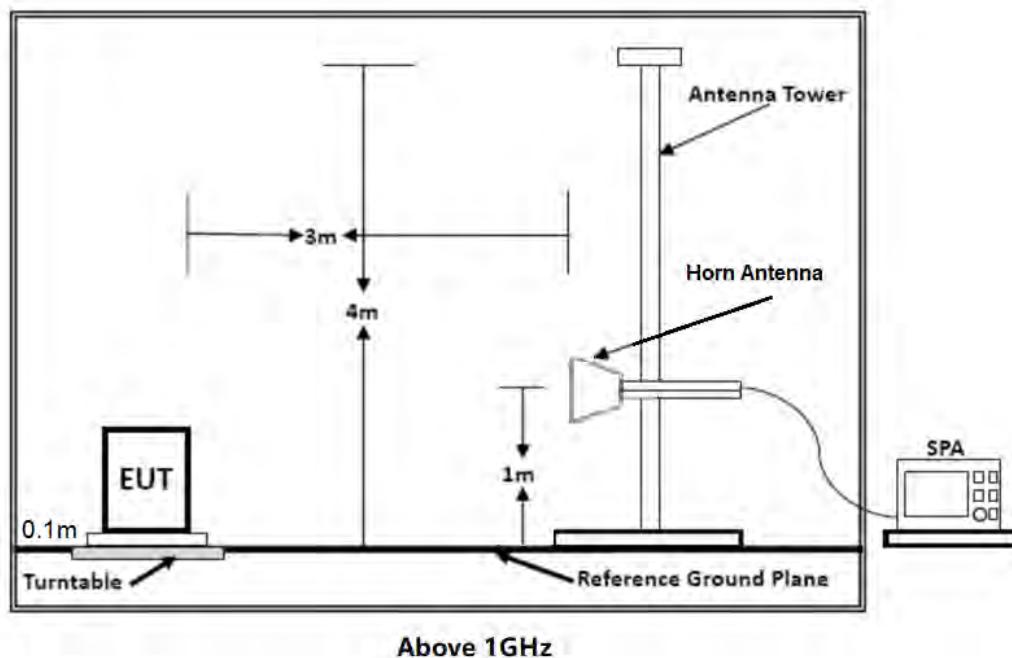
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



Test Procedure

1. The EUT is placed on a low permittivity and low loss tangent wooden table which is 0.1m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0°C to 360°C to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. Radiated emission test frequency band from 9KHz to 40GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Bilog Antenna	3
1GHz-18GHz	Horn Antenna	3
18GHz-25GHz	Horn Antenna	1

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

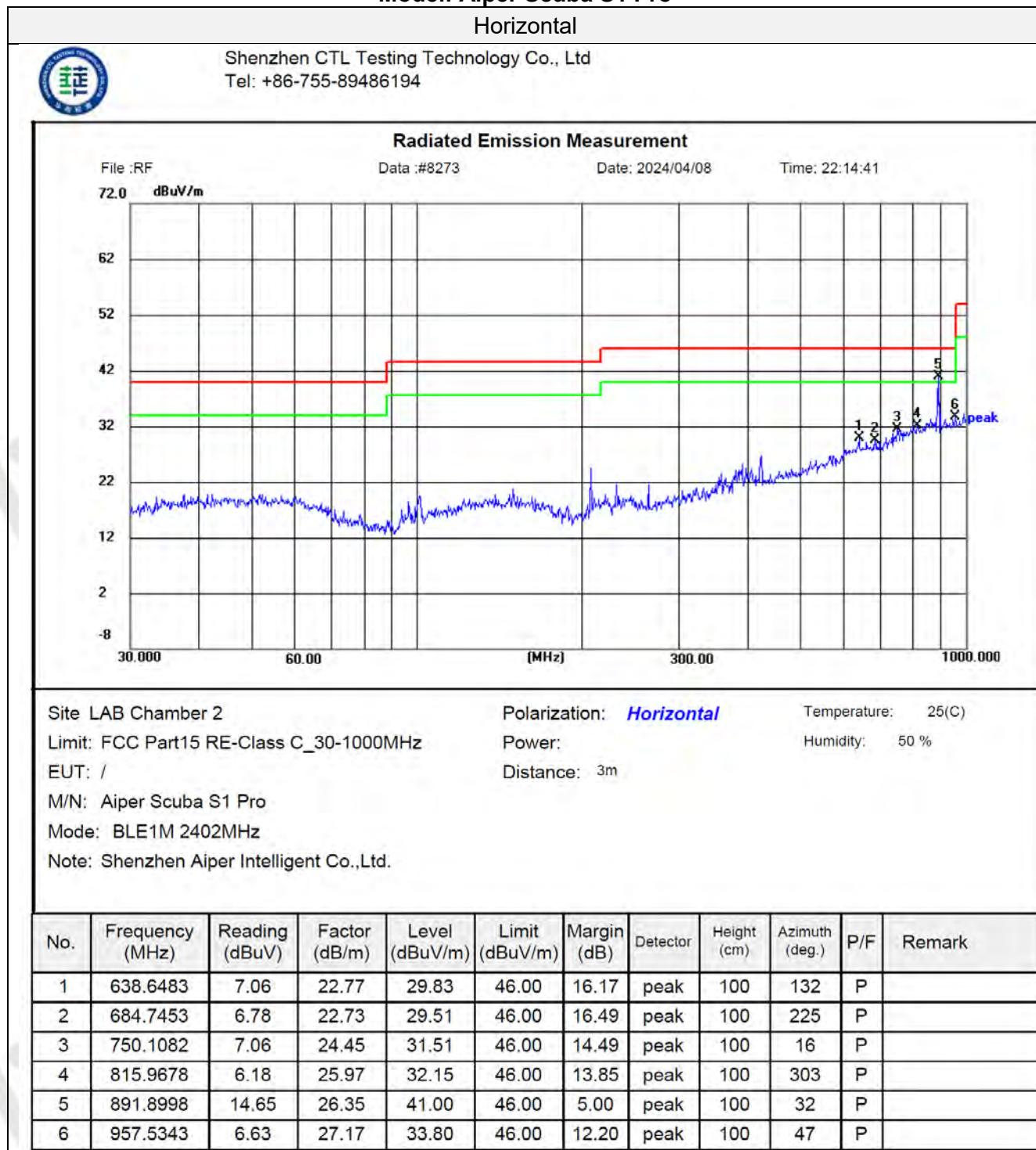
TEST RESULTS

Remark:

- Exploratory measurements were performed from 9KHz to 25GHz with combination of all modulation type and low/middle/high operating channels.
- Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, Found the emission level are attenuated 20dB below the limits from 9 kHz to 30MHz, so it does not record in report.
- For below 1GHz testing recorded worst at BLE 1M Low channel.

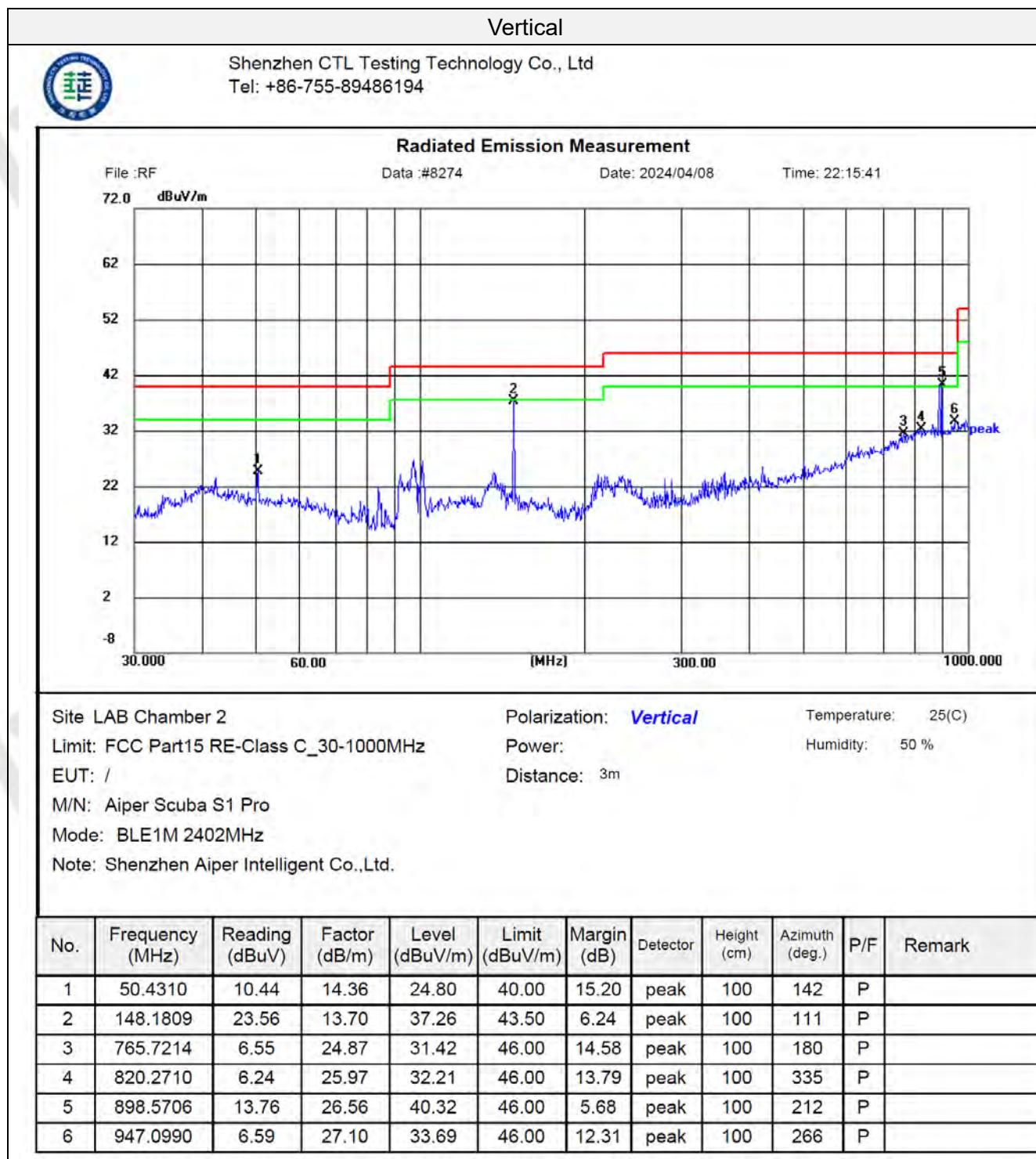
For 30MHz-1GHz

Model: Aiper Scuba S1 Pro



Remark: Level(dBuV/m)=Reading(dBuV)+Factor(dB/m)

Margin= Limit(dBuV/m)- Level(dBuV/m)



Remark: Level(dBuV/m)=Reading(dBuV)+Factor(dB/m)

Margin= Limit(dBuV/m)- Level(dBuV/m)

Model: Aiper Scuba N1 Ultra

Horizontal



Shenzhen CTL Testing Technology Co., Ltd
Tel: +86-755-89486194

Radiated Emission Measurement

File :RF

Data :#8724

Date: 2024/04/26

Time: 14:26:50

72.0 dBuV/m

62

52

42

32

22

12

2

-8

30.000

60.00

(MHz)

300.00

1000.000

Polarization: **Horizontal**

Temperature: 25(C)

Site LAB Chamber 2

Power:

Humidity: 50 %

Limit: FCC Part15 RE-Class C_30-1000MHz

Distance: 3m

EUT: /

M/N: Aiper Scuba N1 Ultra

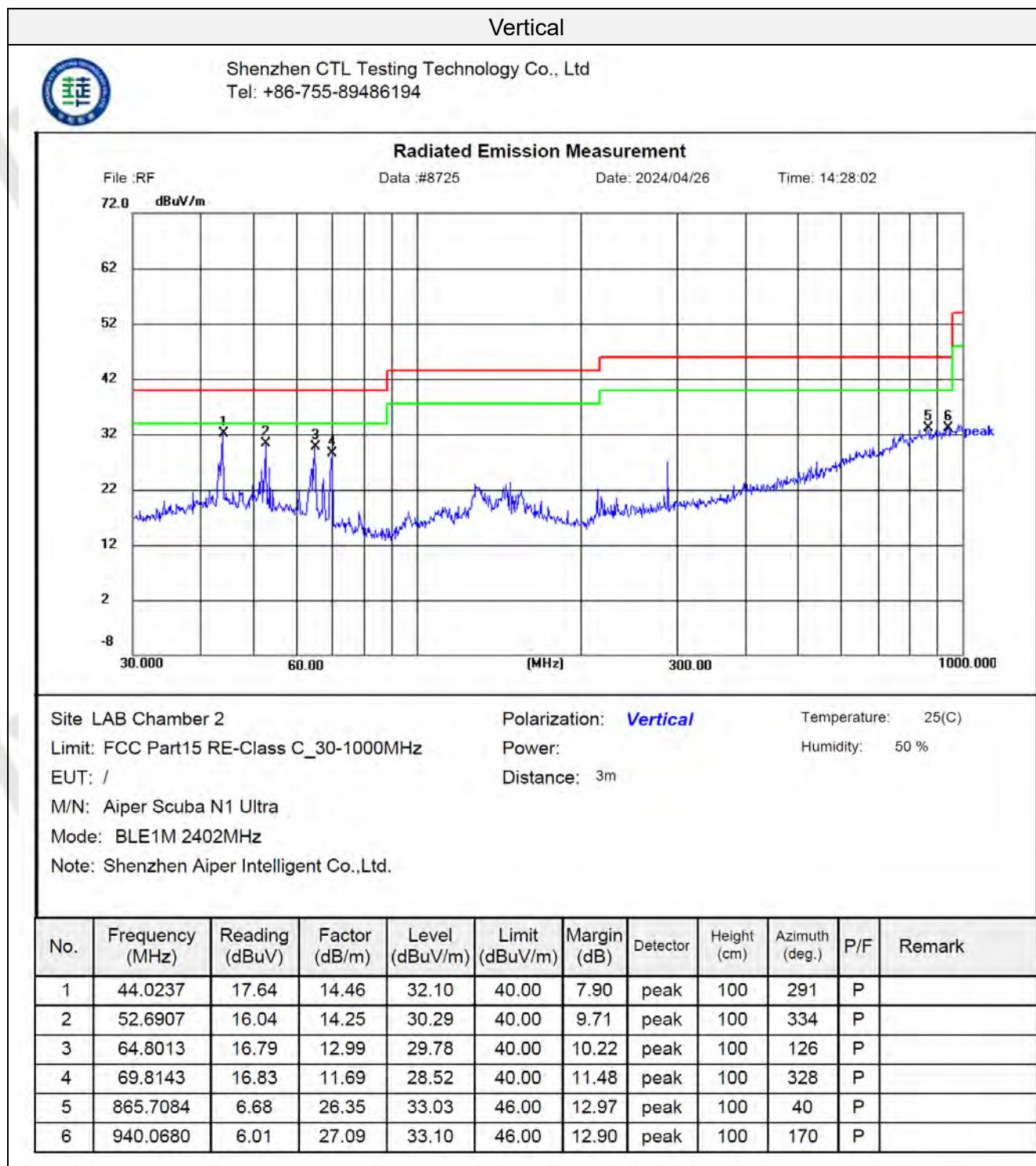
Mode: BLE1M 2402MHz

Note: Shenzhen Aiper Intelligent Co.,Ltd.

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	603.5391	6.59	21.86	28.45	46.00	17.55	peak	100	251	P	
2	646.8183	6.10	22.56	28.66	46.00	17.34	peak	100	269	P	
3	819.9114	6.39	25.98	32.37	46.00	13.63	peak	100	324	P	
4	851.7816	6.33	26.27	32.60	46.00	13.40	peak	100	171	P	
5	914.8648	7.38	26.75	34.13	46.00	11.87	peak	100	300	P	
6	947.9296	6.06	27.11	33.17	46.00	12.83	peak	100	343	P	

Remark: Level(dBuV/m)=Reading(dBuV)+Factor(dB/m)

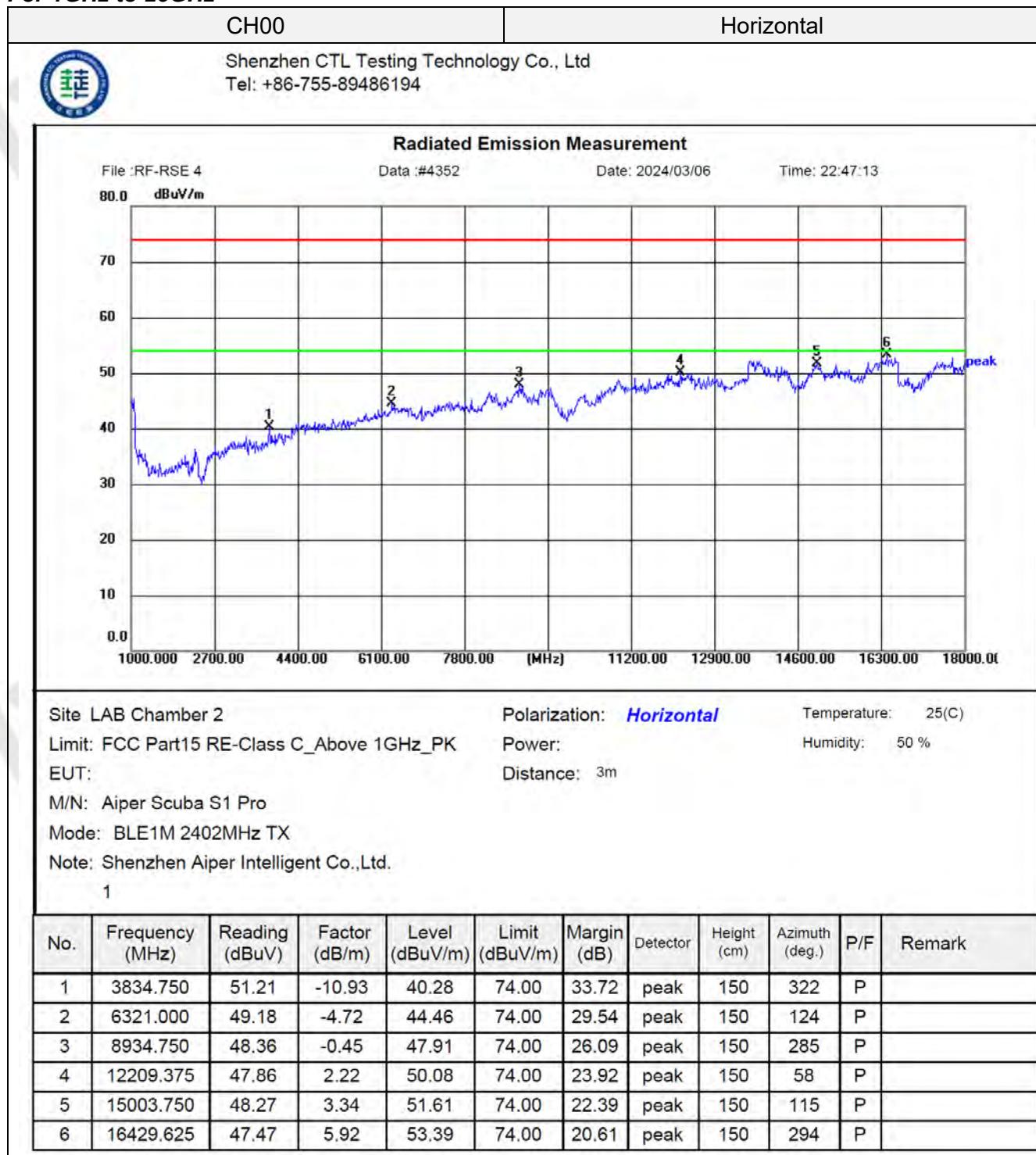
Margin= Limit(dBuV/m)- Level(dBuV/m)

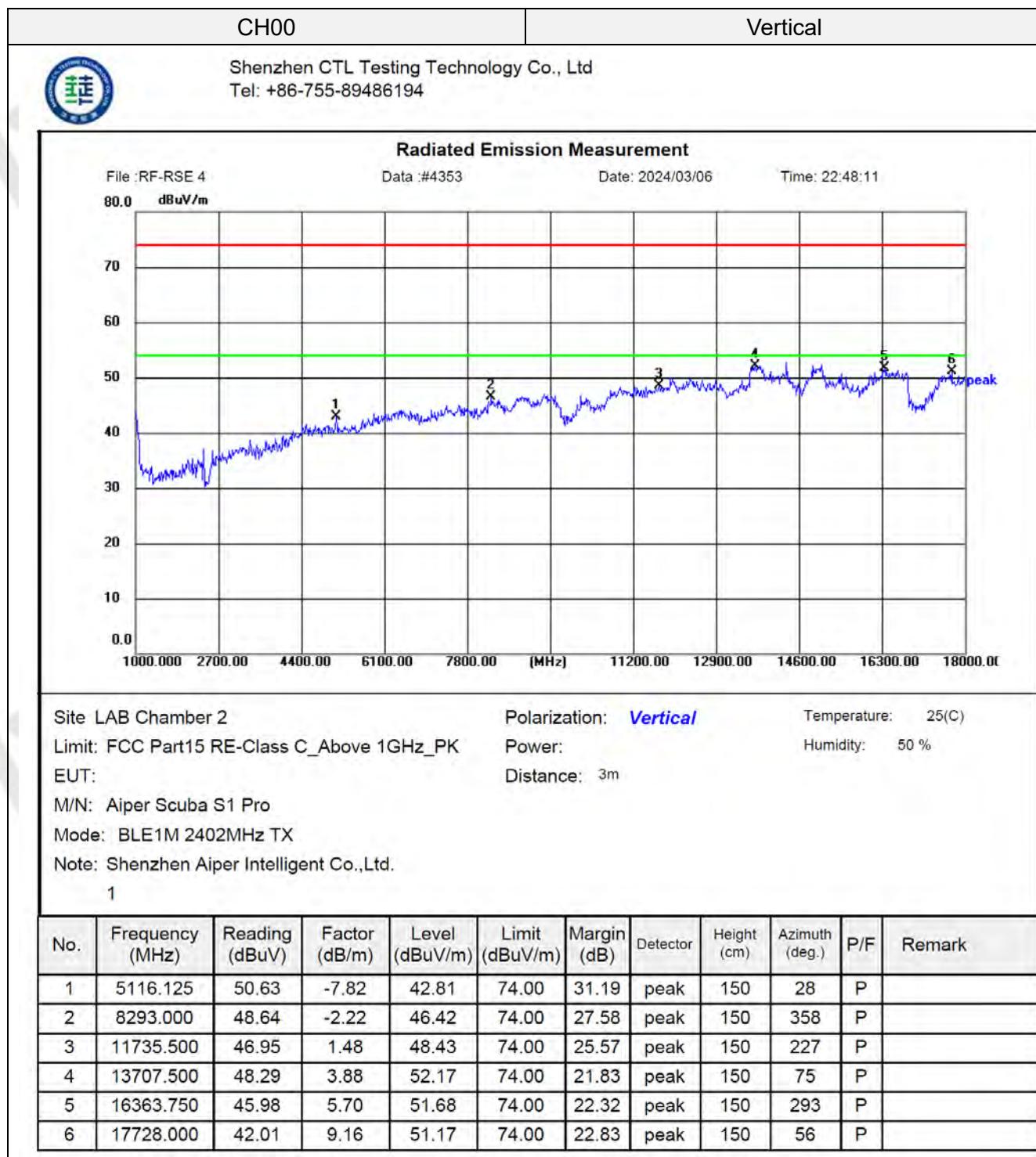


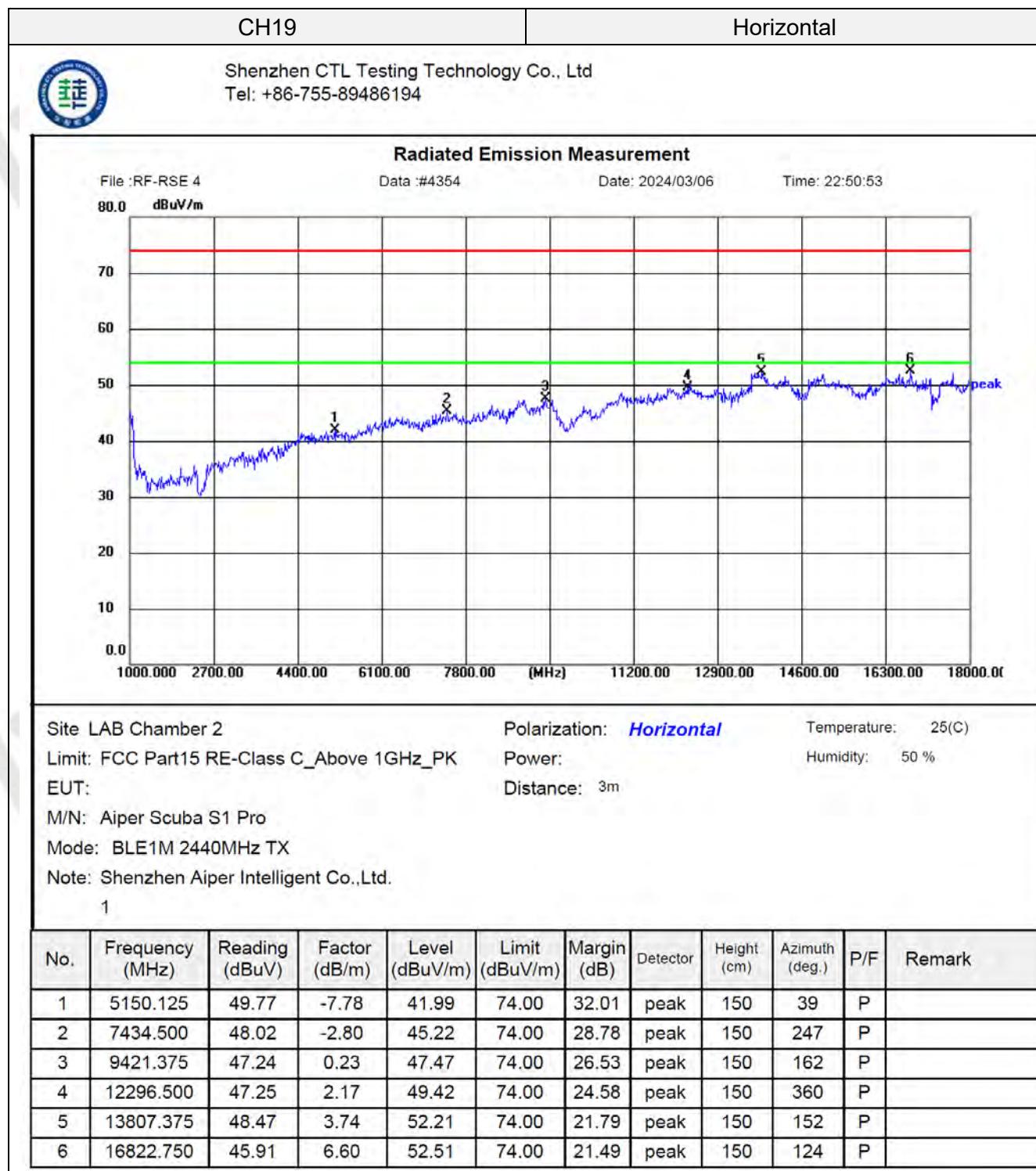
Remark: Level(dBuV/m)=Reading(dBuV)+Factor(dB/m)

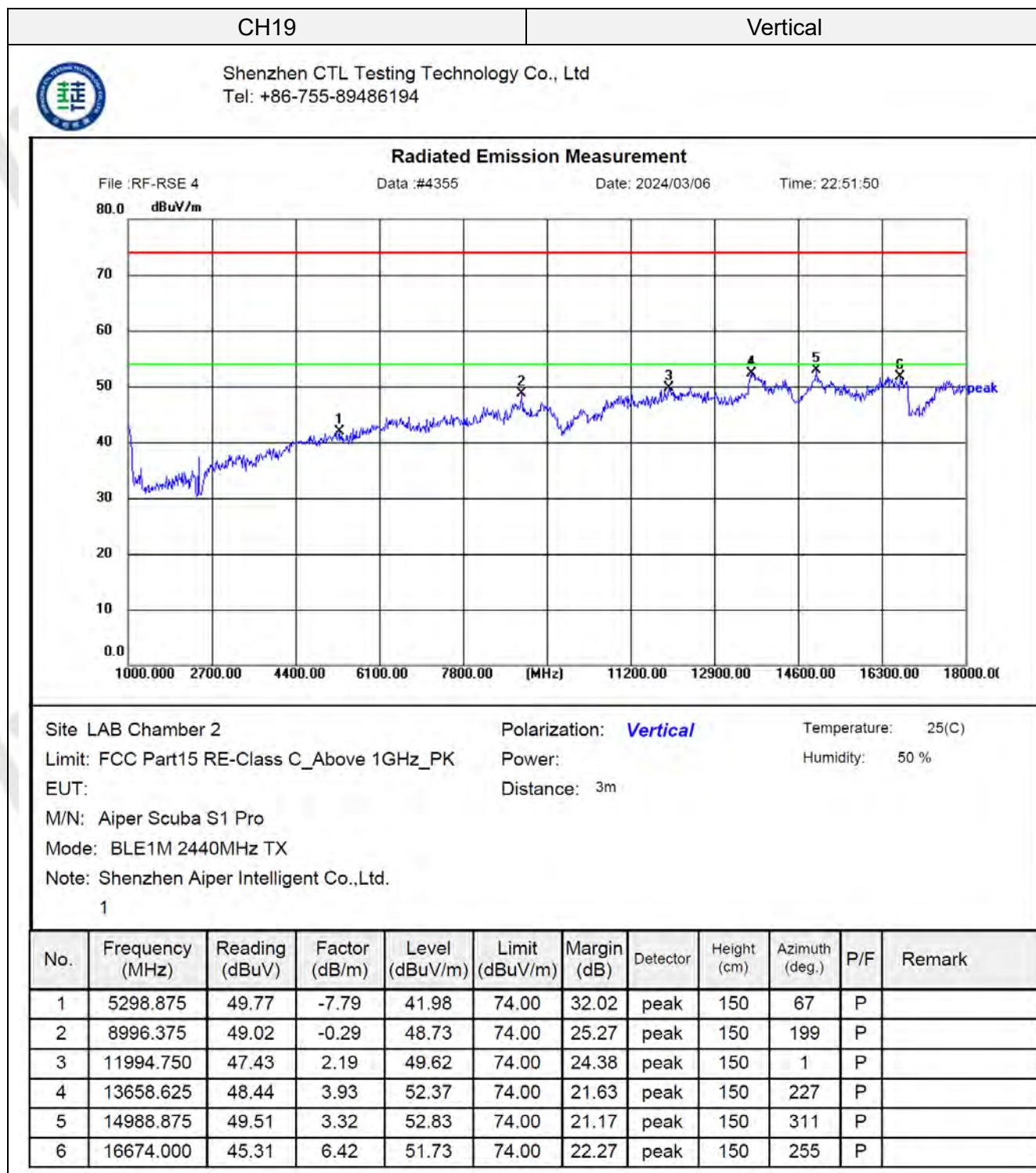
Margin= Limit(dBuV/m)- Level(dBuV/m)

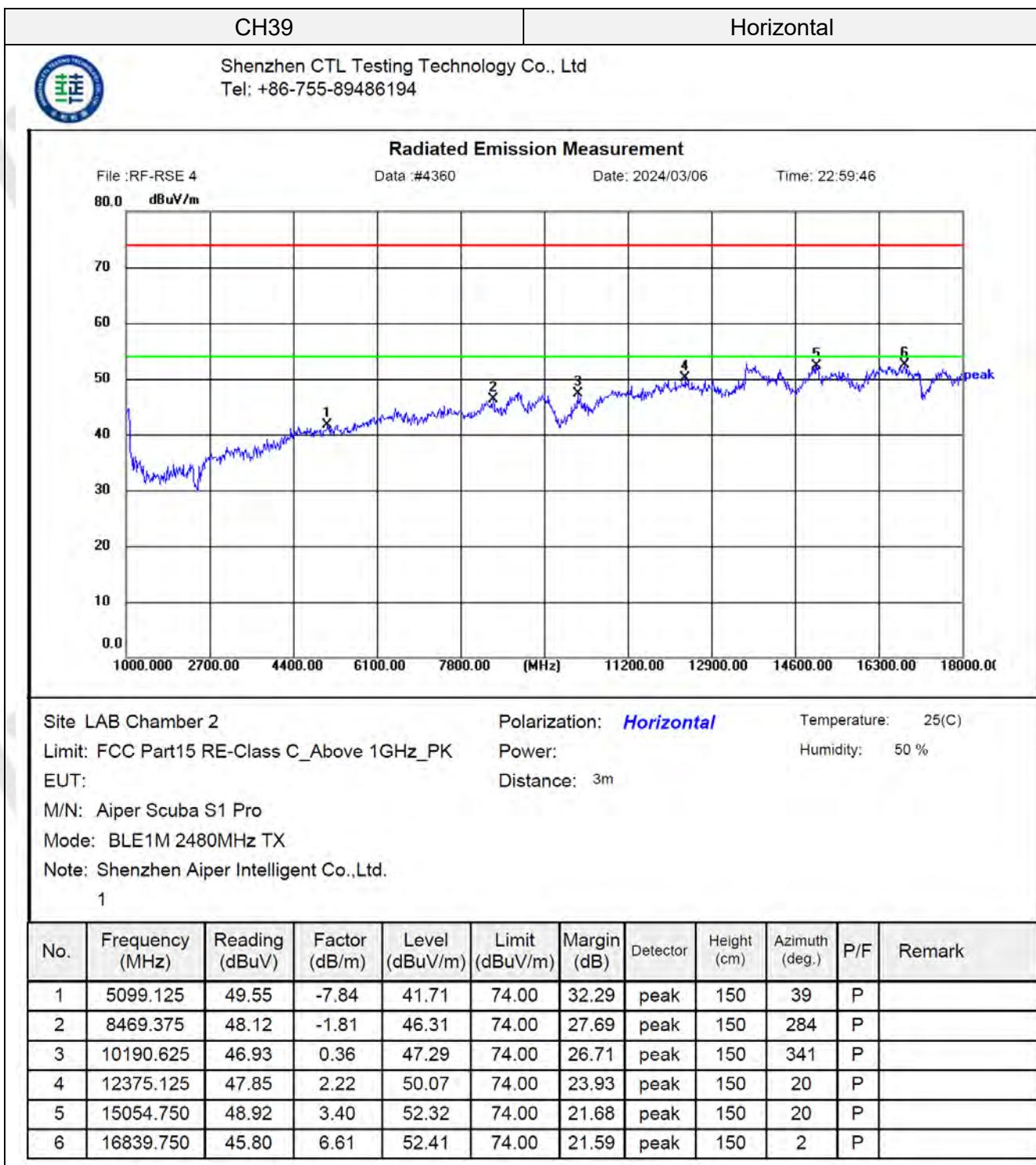
For 1GHz to 25GHz

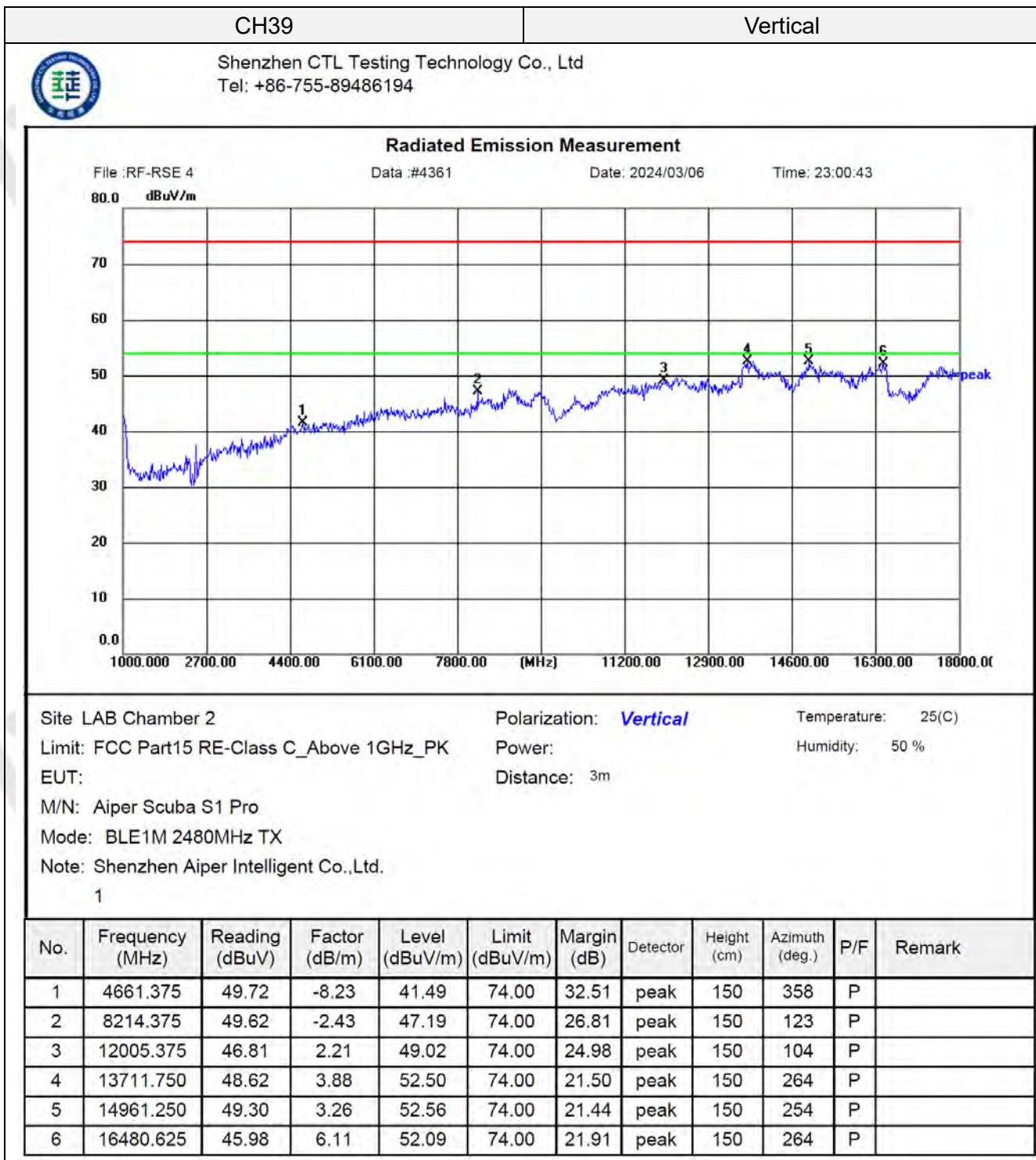








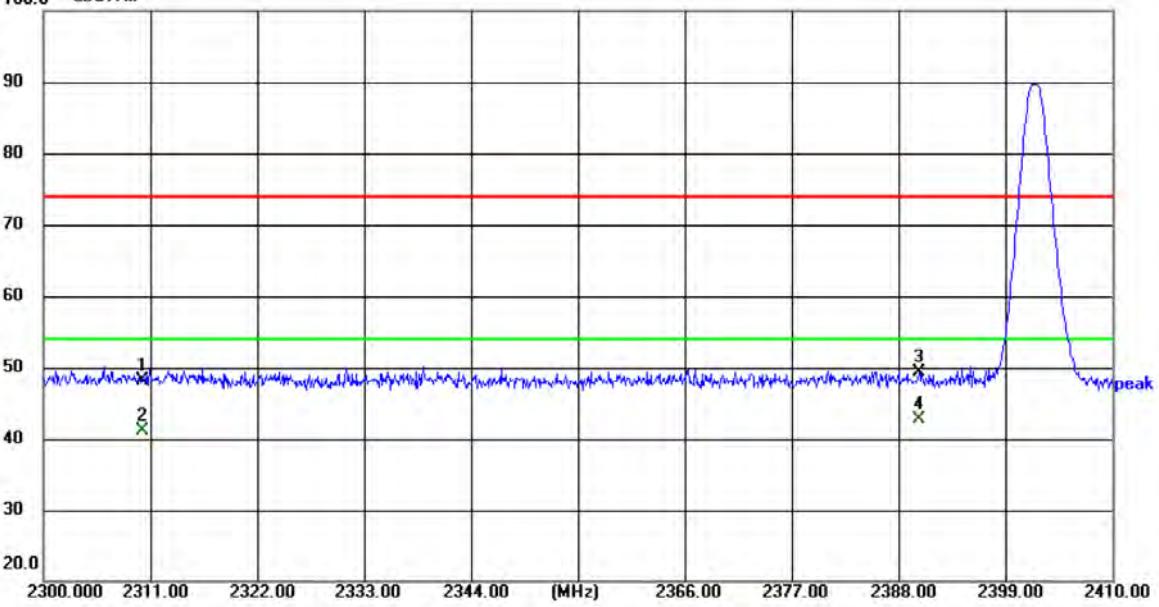


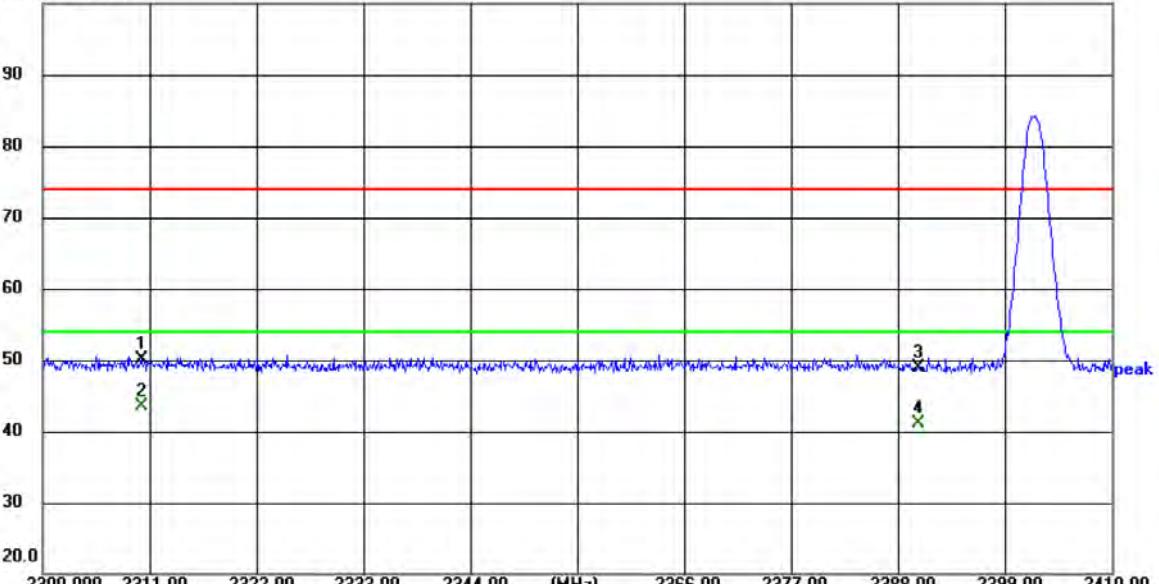


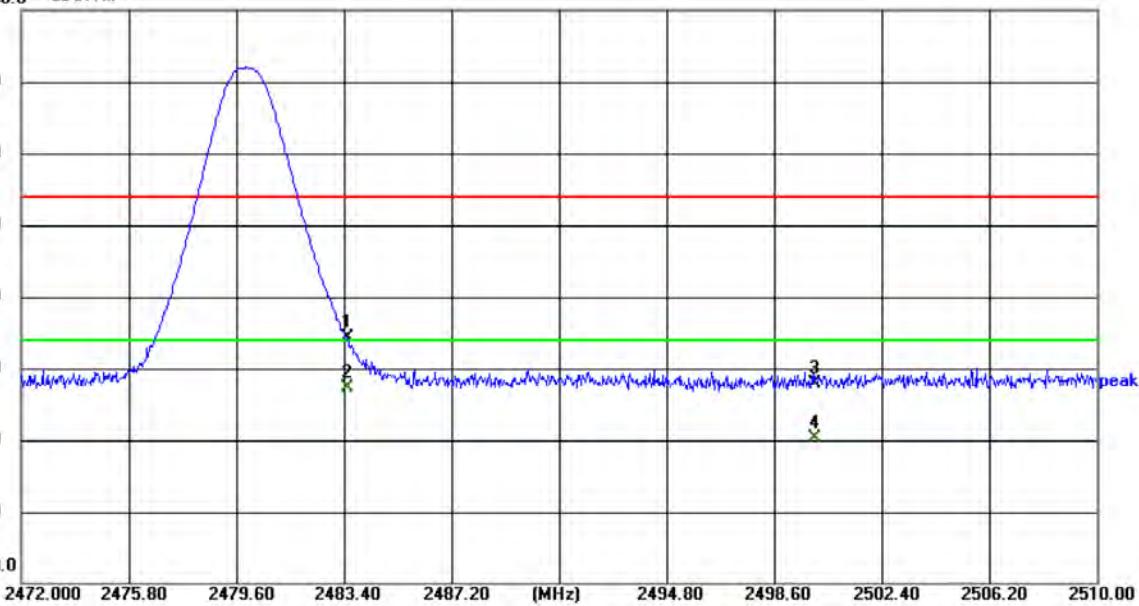
REMARKS:

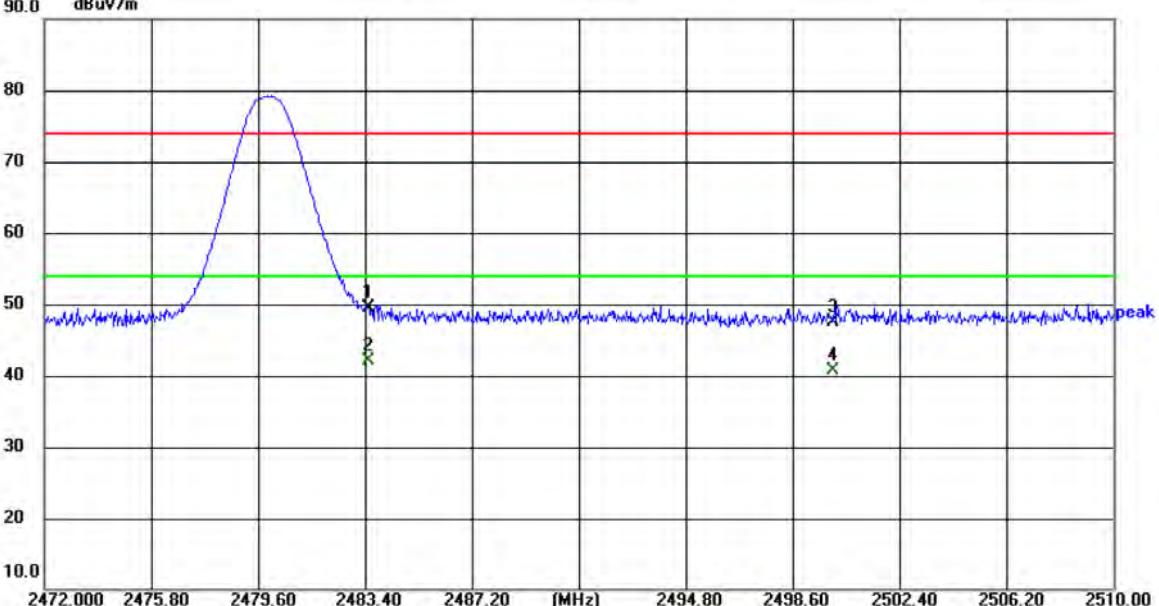
1. Level (dBuV/m) = Reading (dBuV) + Factor (dB/m).
2. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) - Pre-amplifier Factor.
3. Margin value = Limit(dBuV/m) - Level(dBuV/m).
4. PK detector measurement value is lower than the average limit. Therefore, there is no need to test AV detector measurements.
5. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.
6. Other emissions are attenuated 20dB below the limits from 9kHz to 30MHz, so it does not record in report.
7. 18GHz-26GHz not recorded for no spurious point have a margin of less than 6 dB with respect to the limits.

Results of Band Edges Test (Radiated)

Test frequency:	2402 MHz	Polarization:	Horizontal								
	Shenzhen CTL Testing Technology Co., Ltd Tel: +86-755-89486194										
Radiated Emission Measurement											
File :RF-RSE 4	Data :#4369	Date: 2024/03/06	Time: 23:23:27								
100.0 dBuV/m											
90											
80											
70											
60											
50											
40											
30											
20.0											
2300.000 2311.00 2322.00 2333.00 2344.00 (MHz) 2366.00 2377.00 2388.00 2399.00 2410.00											
											
Site LAB Chamber 2	Polarization: Horizontal	Temperature: 25(C)									
Limit: FCC Part 15 C	Power:	Humidity: 50 %									
EUT:	Distance: 3m										
M/N: Aiper Scuba S1 Pro											
Mode: BLE1M 2402MHz TX											
Note: Shenzhen Aiper Intelligent Co.,Ltd.											
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2310.120	38.93	9.10	48.03	74.00	25.97	peak	150	360	P	
2	2310.120	32.05	9.10	41.15	54.00	12.85	AVG	150	0	P	
3	2390.090	40.03	9.18	49.21	74.00	24.79	peak	150	360	P	
4	2390.090	33.45	9.18	42.63	54.00	11.37	AVG	150	0	P	

Test frequency:		2402 MHz		Polarization:			Vertical				
		Shenzhen CTL Testing Technology Co., Ltd Tel: +86-755-89486194									
Radiated Emission Measurement											
File : RF-RSE 4			Data : #4368			Date: 2024/03/06					
100.0 dBuV/m						Time: 23:22:27					
											
Site: LAB Chamber 2			Polarization: Vertical			Temperature: 25(C)					
Limit: FCC Part 15 C			Power:			Humidity: 50 %					
EUT:			Distance: 3m								
M/N: Aiper Scuba S1 Pro											
Mode: BLE1M 2402MHz TX											
Note: Shenzhen Aiper Intelligent Co.,Ltd.											
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2310.120	40.98	9.10	50.08	74.00	23.92	peak	150	360	P	
2	2310.120	34.34	9.10	43.44	54.00	10.56	AVG	150	0	P	
3	2390.090	39.76	9.18	48.94	74.00	25.06	peak	150	360	P	
4	2390.090	31.99	9.18	41.17	54.00	12.83	AVG	150	0	P	

Test frequency:		2480 MHz		Polarization:			Horizontal					
		Shenzhen CTL Testing Technology Co., Ltd			Tel: +86-755-89486194							
Radiated Emission Measurement												
File :RF-RSE 4		Data #:4362			Date: 2024/03/06		Time: 23:13:34					
100.0 dBuV/m												
Site: LAB Chamber 2					Polarization: Horizontal			Temperature: 25(C)				
Limit: FCC Part 15 C					Power:			Humidity: 50 %				
EUT:					Distance: 3m							
M/N: Aiper Scuba S1 Pro												
Mode: BLE1M 2480MHz TX												
Note: Shenzhen Aiper Intelligent Co.,Ltd.												
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark	
1	2483.514	45.03	9.35	54.38	74.00	19.62	peak	150	360	P		
2	2483.514	37.97	9.35	47.32	54.00	6.68	AVG	150	0	P		
3	2500.006	38.42	9.42	47.84	74.00	26.16	peak	150	360	P		
4	2500.006	30.90	9.42	40.32	54.00	13.68	AVG	150	0	P		

Test frequency:		2480 MHz		Polarization:			Vertical				
		Shenzhen CTL Testing Technology Co., Ltd			Tel: +86-755-89486194						
Radiated Emission Measurement											
File :RF-RSE 4			Data #:4363			Date: 2024/03/06		Time: 23:14:52			
											
Site: LAB Chamber 2			Polarization: Vertical			Temperature: 25(C)					
Limit: FCC Part 15 C			Power:			Humidity: 50 %					
EUT:			Distance: 3m								
M/N: Aiper Scuba S1 Pro											
Mode: BLE1M 2480MHz TX											
Note: Shenzhen Aiper Intelligent Co.,Ltd.											
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2483.514	40.08	9.35	49.43	74.00	24.57	peak	150	360	P	
2	2483.514	32.78	9.35	42.13	54.00	11.87	AVG	150	0	P	
3	2500.006	38.06	9.42	47.48	74.00	26.52	peak	150	360	P	
4	2500.006	31.29	9.42	40.71	54.00	13.29	AVG	150	0	P	

REMARKS:

1. Level (dBuV/m) = Reading (dBuV) + Factor (dB/m).
2. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) - Pre-amplifier Factor.
3. Margin value = Limit(dBuV/m) - Level(dBuV/m).
4. Other emission levels are attenuated 20dB below the limit and not recorded in report.
5. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.

3.3. Maximum Peak Conducted Output Power

Limit

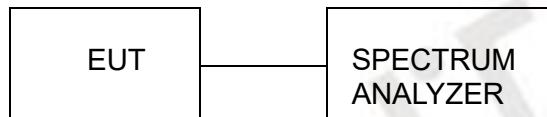
The Maximum Peak Output Power Measurement is 30dBm.

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer. The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

- a) Set the $RBW \geq DTS$ bandwidth.
- b) Set $VBW \geq 3 \times RBW$
- c) Set span $\geq 3 \times RBW$
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

Test Configuration



Test Results

Raw data reference to Appendix RF test data for BLE.

3.4. Power Spectral Density

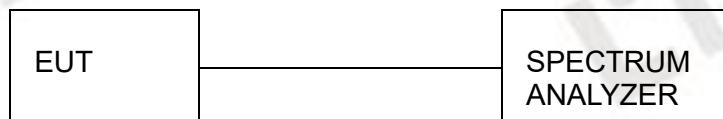
Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW \geq 3 kHz.
3. Set the VBW $\geq 3 \times$ RBW.
4. Set the span to 1.5 times the DTS channel bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be 8dBm.

Test Configuration



Test Results

Raw data reference to Appendix RF test data for BLE.

3.5. 6dB Bandwidth

Limit

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 KHz RBW and 300 KHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

Test Configuration



Test Results

Raw data reference to Appendix RF test data for BLE.

3.6. Out-of-band Emissions

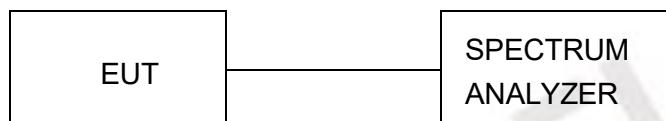
Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

Test Procedure

Connect the transmitter output to spectrum analyzer using a low loss RF cable, and set the spectrum analyzer to RBW=100 kHz, VBW= 300 kHz, peak detector, and max hold. Measurements utilizing these setting are made of the in-band reference level, bandedge and out-of-band emissions.

Test Configuration



Test Results

Raw data reference to Appendix RF test data for BLE.

3.7. Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203:

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

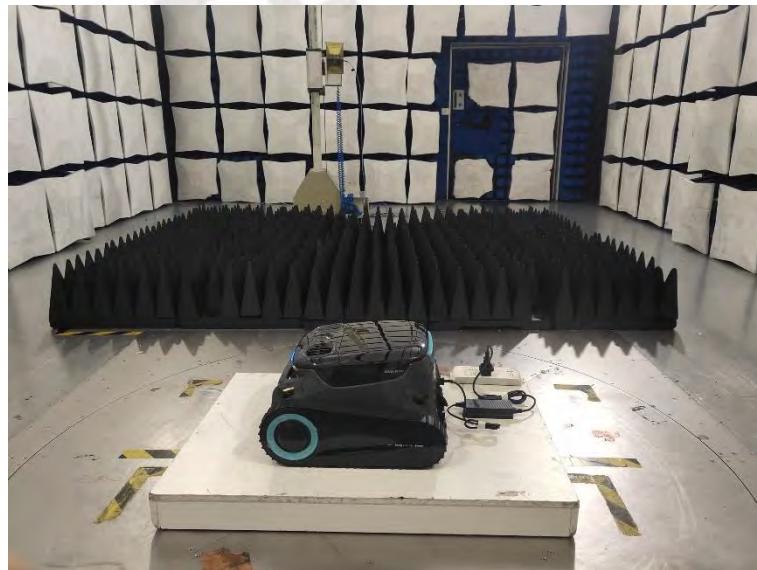
FCC CFR Title 47 Part 15 Subpart C Section 15.247(b) (4):

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Result

The maximum gain of antenna was 3.37dBi with impedance 50Ω .

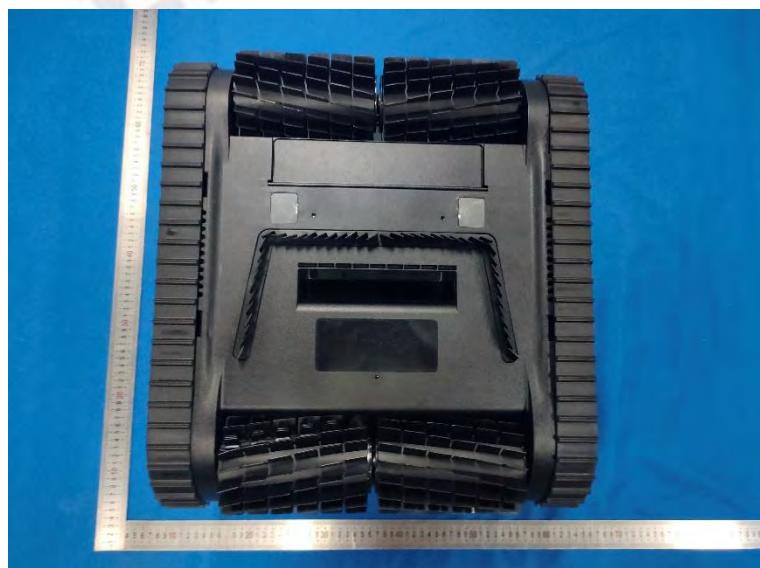
4. Test Setup Photos of the EUT



5. Photos of the EUT

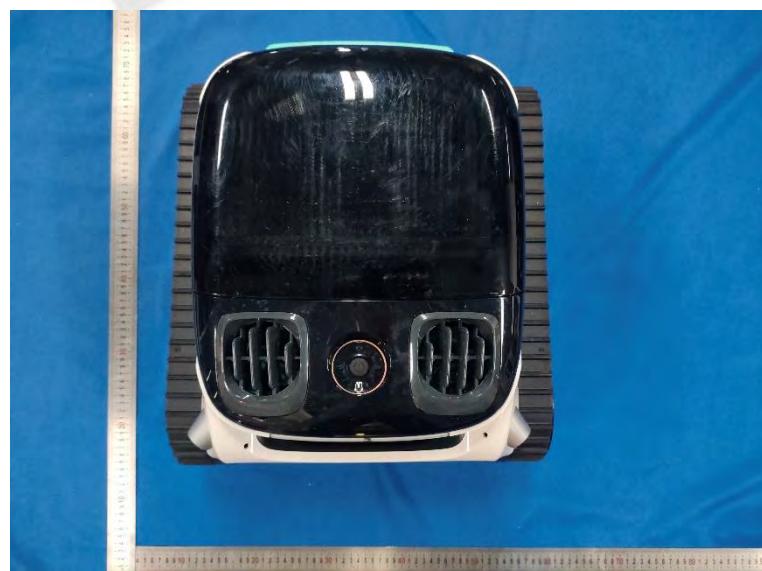
External Photos of EUT

Aiper Scuba S1 Pro



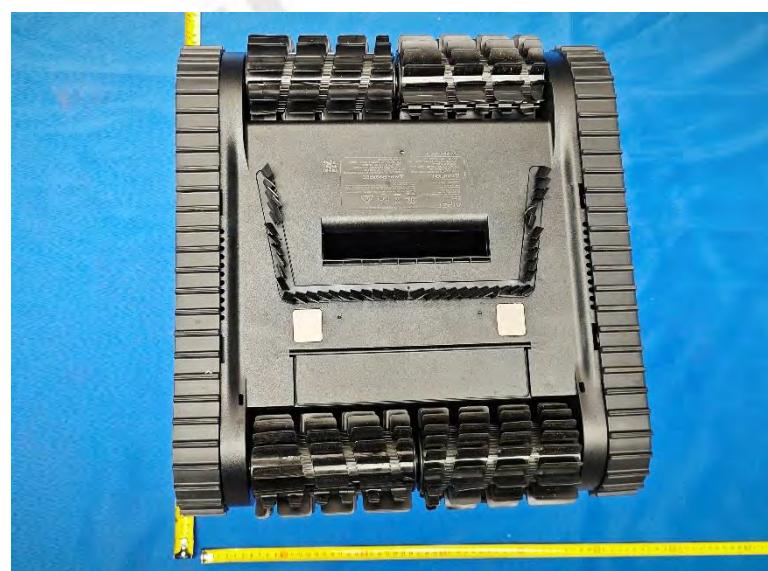


Aiper Scuba N1 Pro





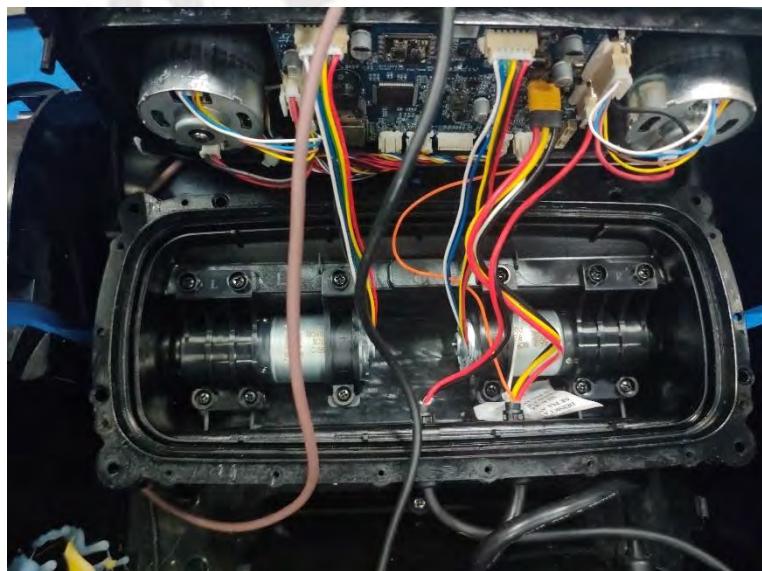
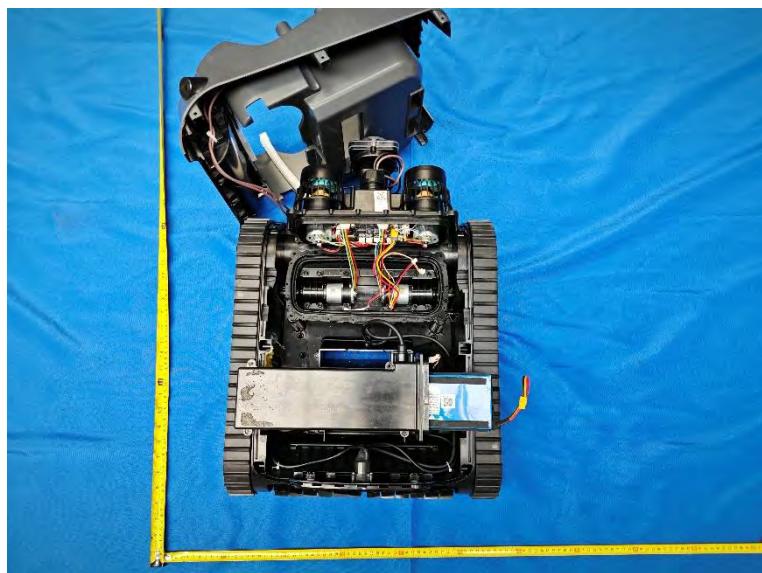
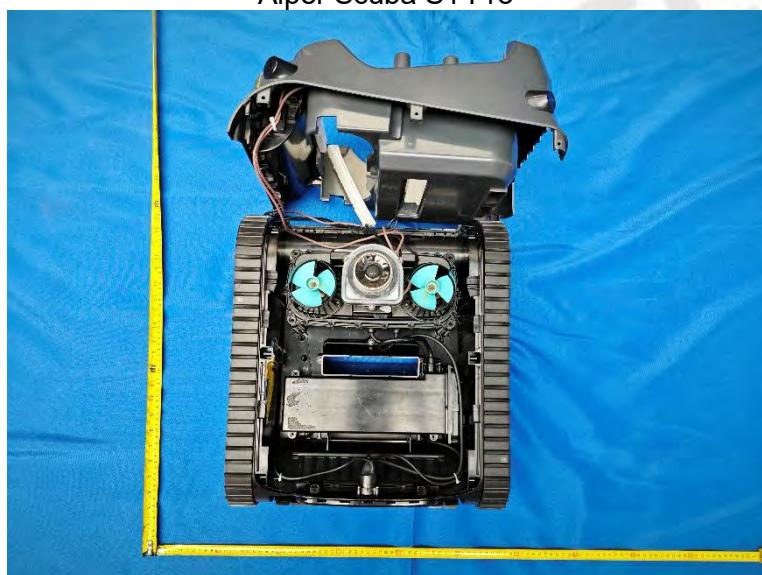
Aiper Scuba N1 Ultra

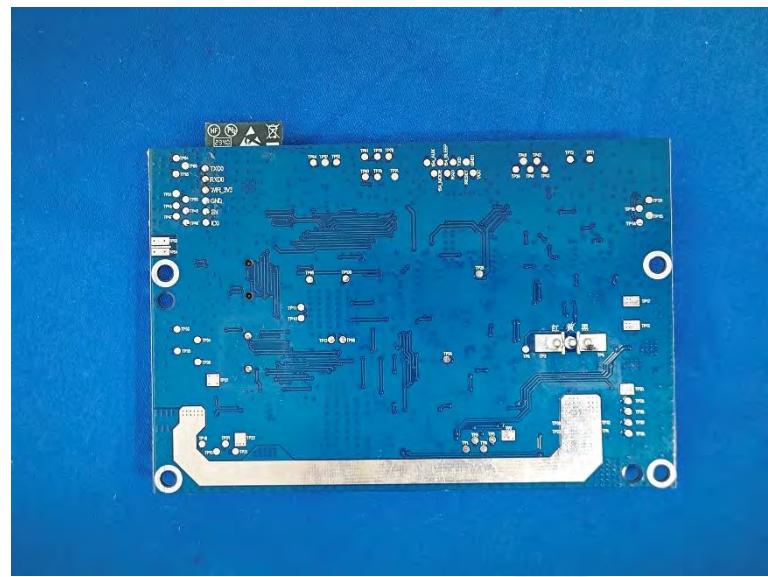
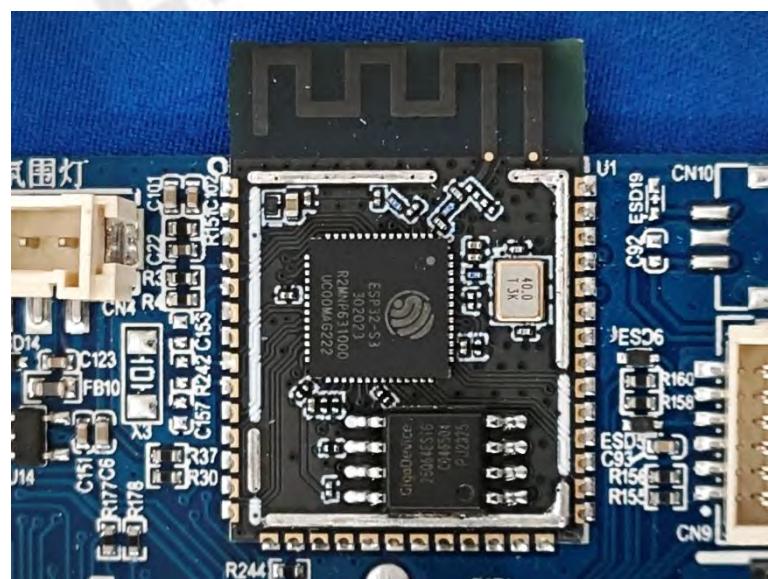
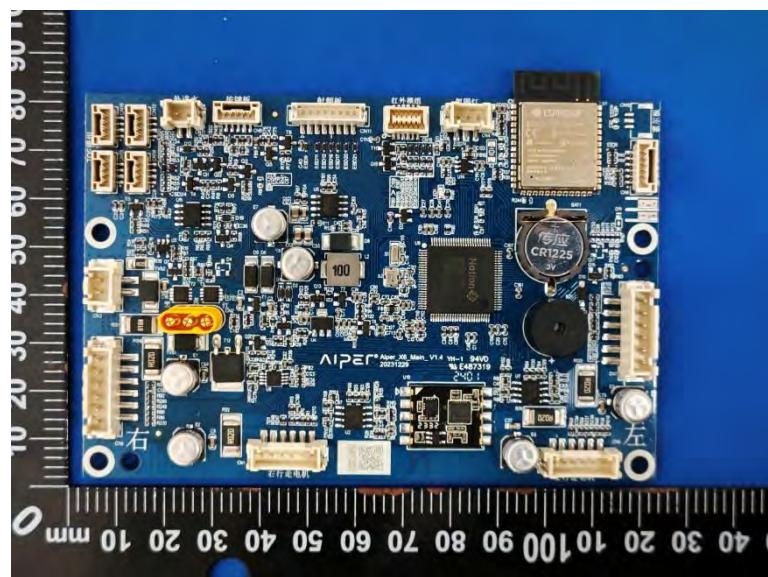


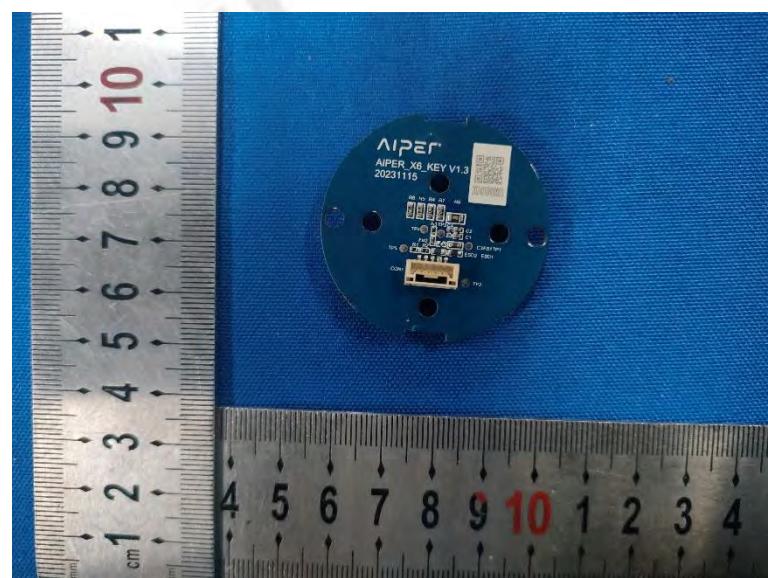


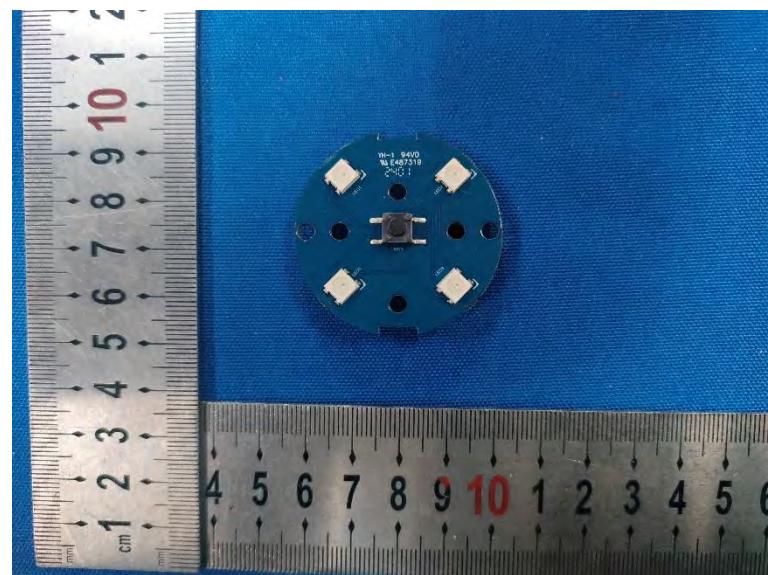
Internal Photos of EUT

Aiper Scuba S1 Pro

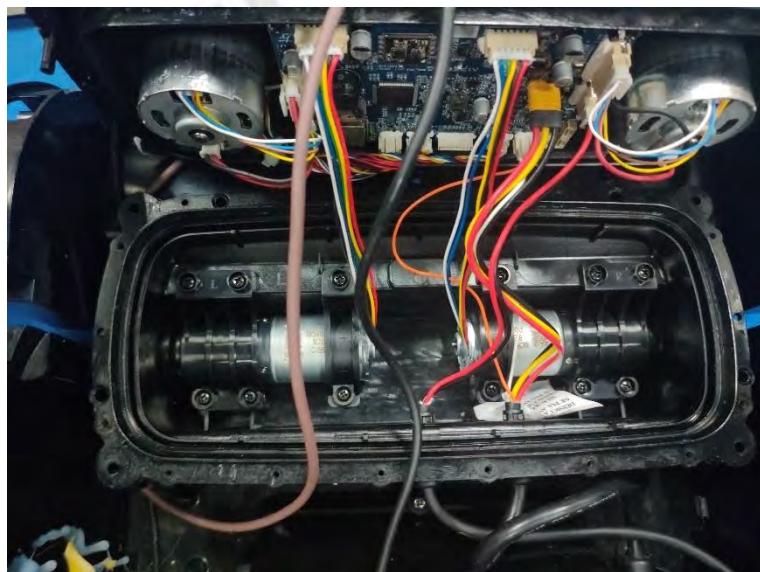
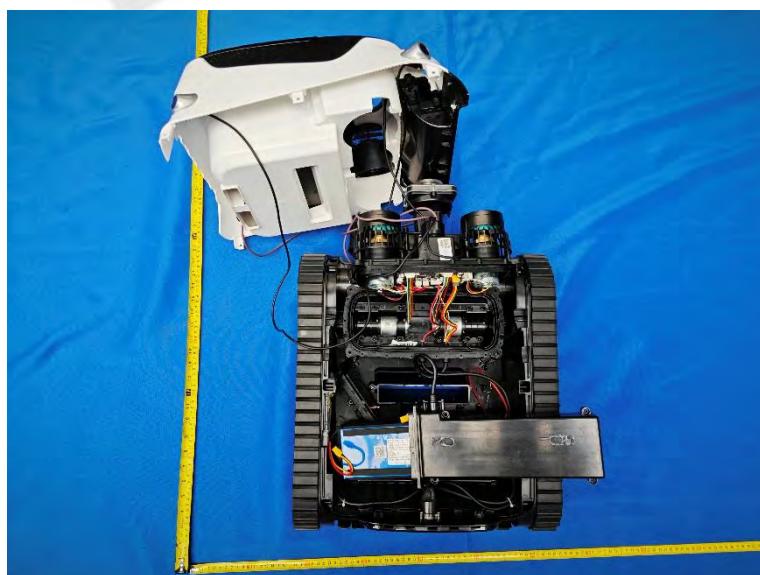
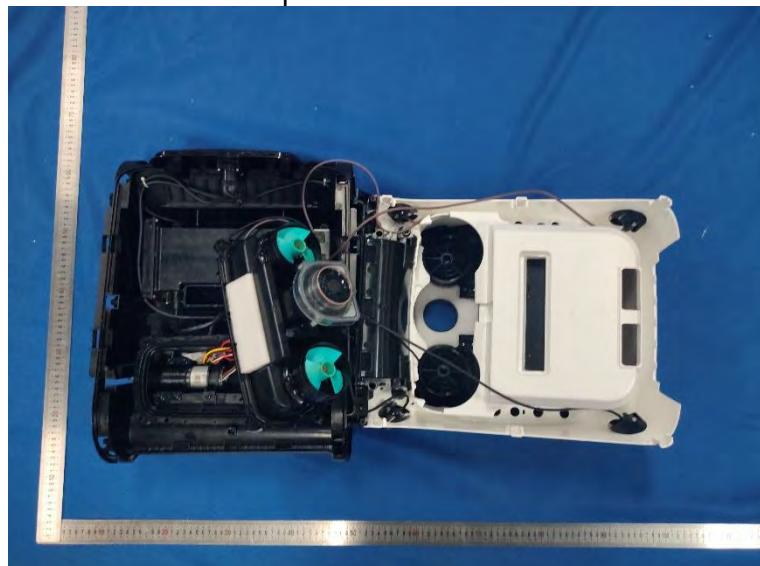


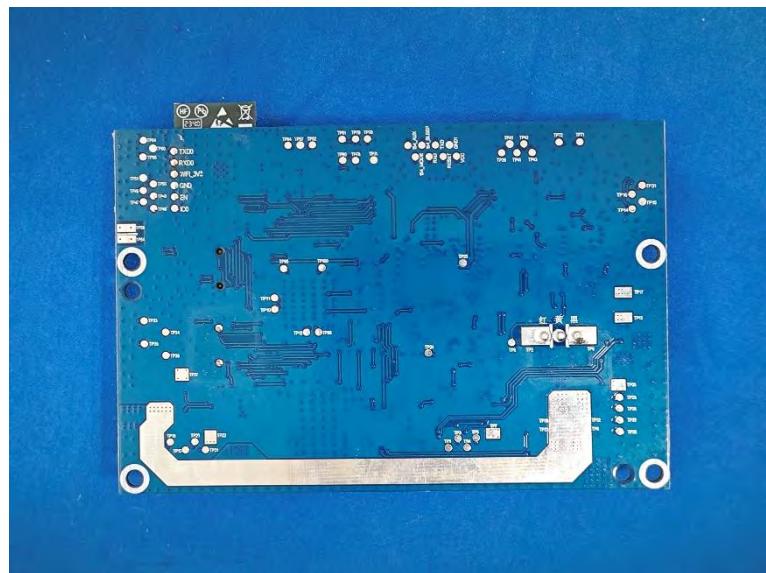
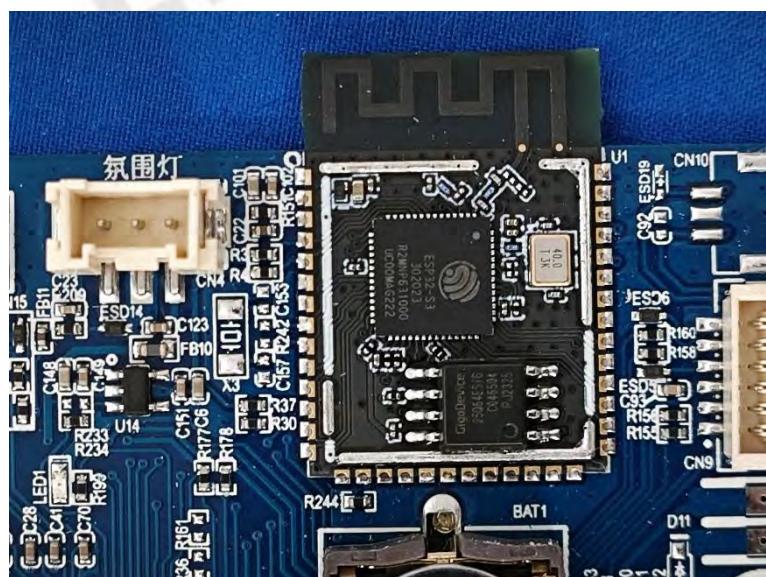
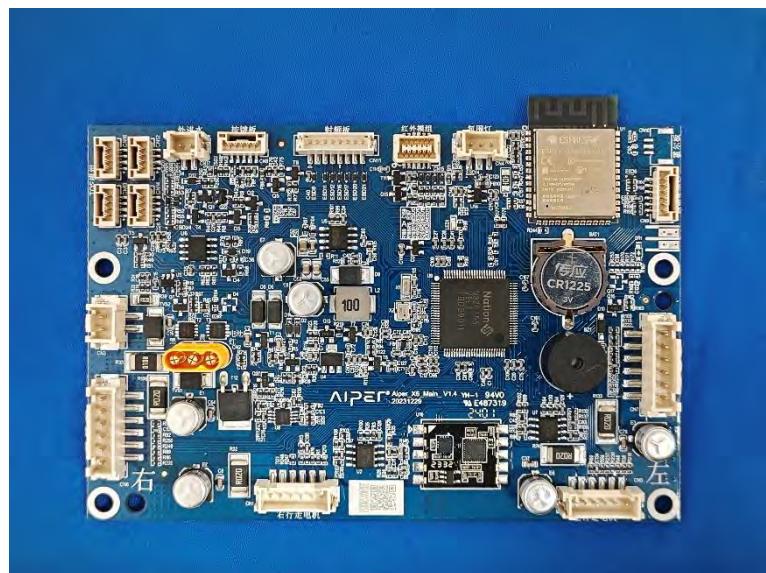


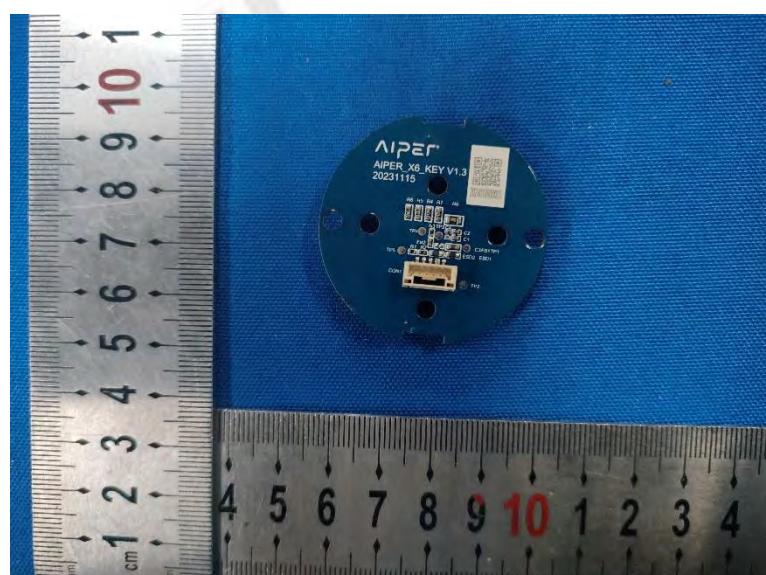


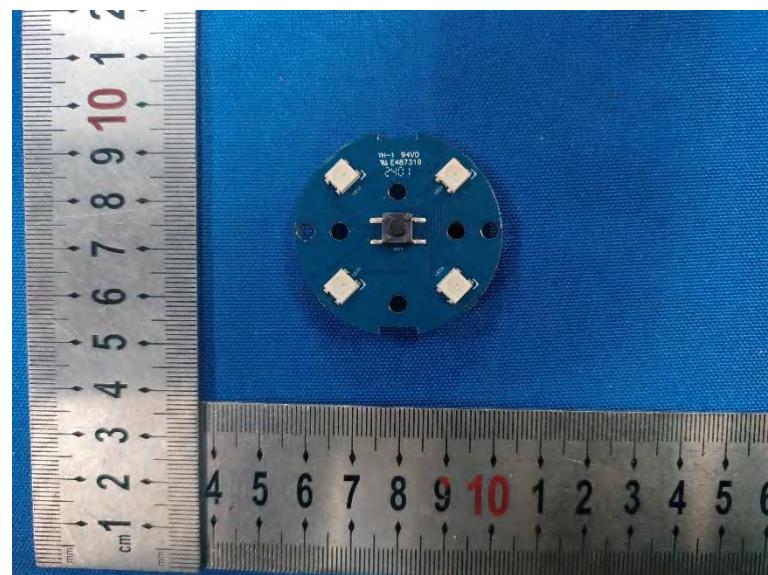


Aiper Scuba N1 Pro

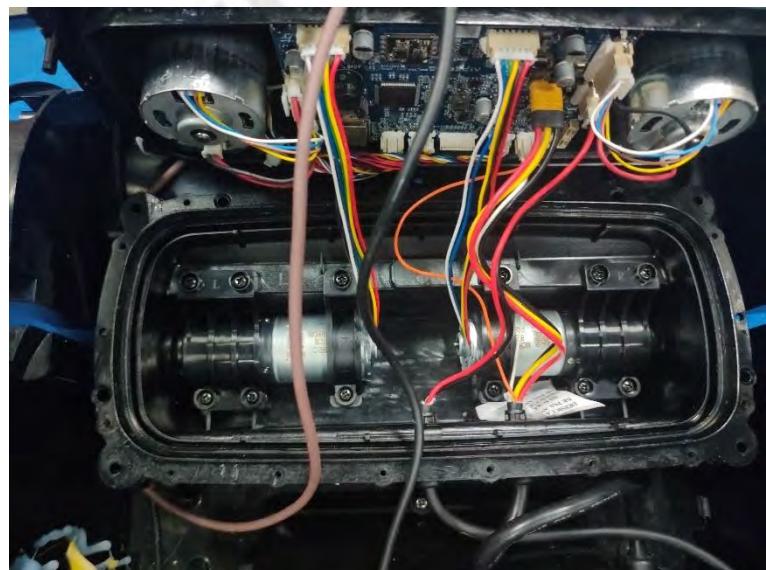
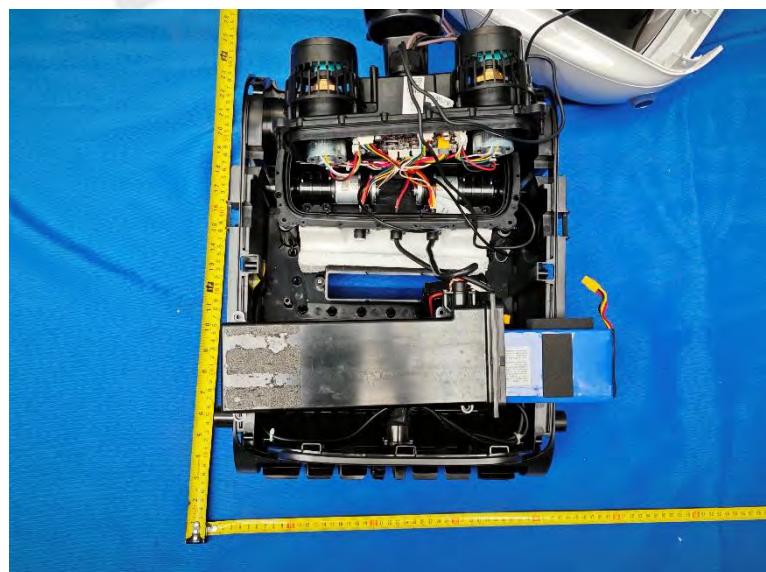
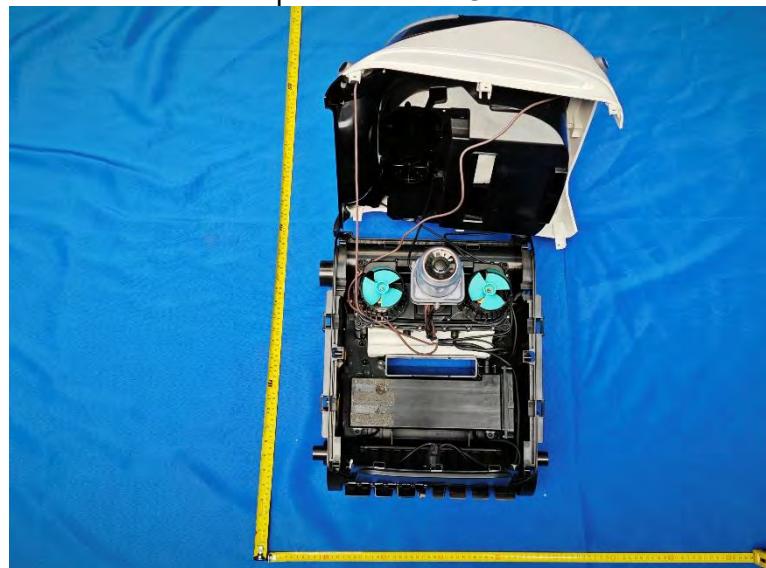


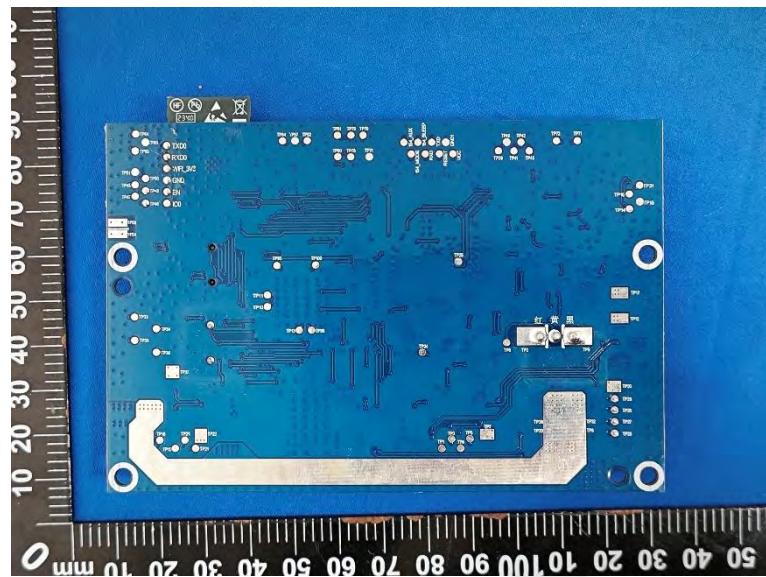
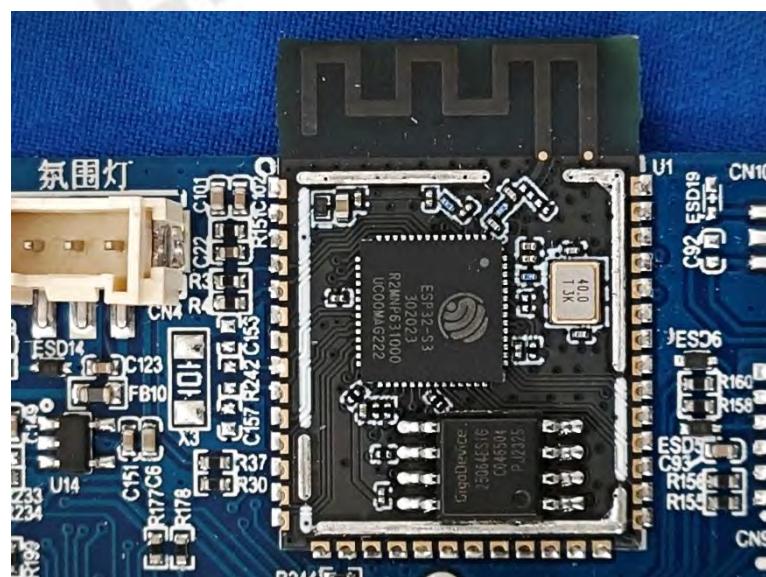
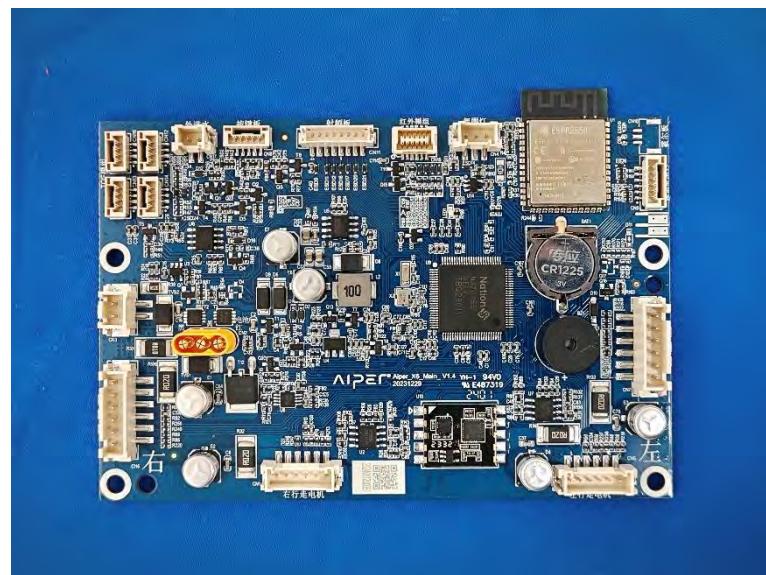


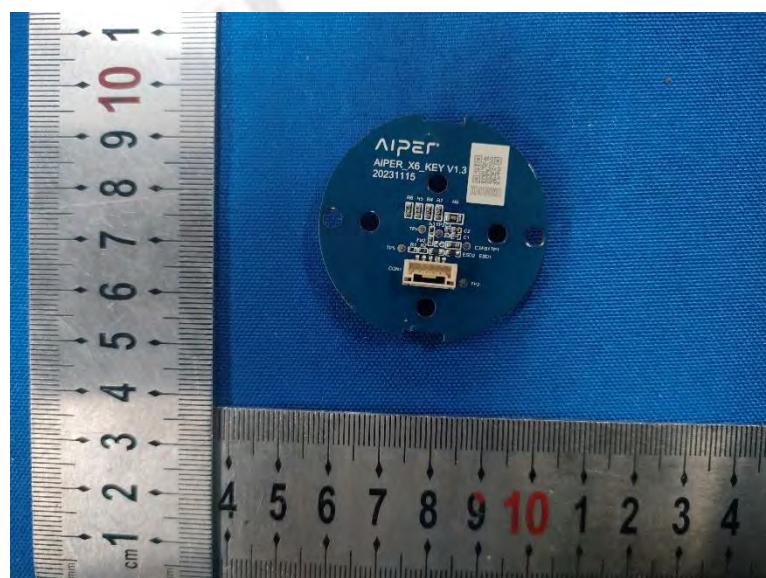


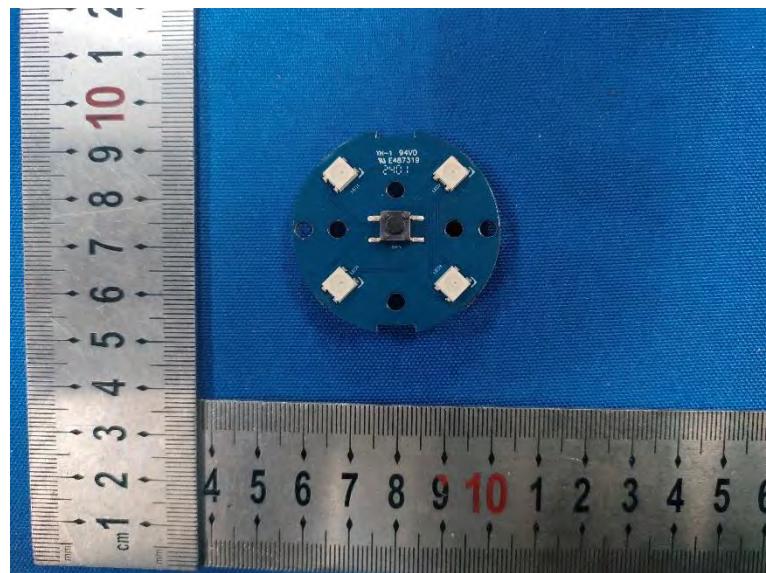


Aiper Scuba N1 Ultra









***** End of Report *****