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TEST REPORT

FCC PART 15 SUBPART C 15.247

Report Reference No. : CTL2402267012-WF02

Compiled by:
(position+printed name+signature)

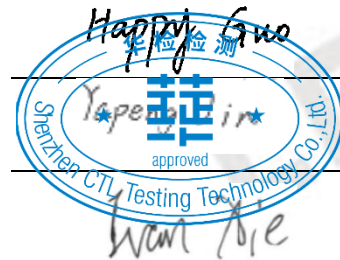
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Product Name : Robotic Pool Cleaner

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-WF02	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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Table of Contents

Page

1. SUMMARY	5
1.1. TEST STANDARDS	5
1.2. TEST DESCRIPTION	5
1.3. TEST FACILITY	6
1.4. STATEMENT OF THE MEASUREMENT UNCERTAINTY	6
2. GENERAL INFORMATION.....	8
2.1. ENVIRONMENTAL CONDITIONS	8
2.2. GENERAL DESCRIPTION OF EUT.....	8
2.3. DESCRIPTION OF TEST MODES AND TEST FREQUENCY	9
2.4. EQUIPMENTS USED DURING THE TEST.....	10
2.5. RELATED SUBMITTAL(S) / GRANT (S)	11
2.6. MODIFICATIONS	11
3. TEST CONDITIONS AND RESULTS.....	12
3.1. CONDUCTED EMISSIONS TEST	12
3.2. RADIATED EMISSIONS AND BAND EDGE.....	17
3.3. MAXIMUM CONDUCTED OUTPUT POWER	33
3.4. POWER SPECTRAL DENSITY.....	34
3.5. 6DB BANDWIDTH	35
3.6. OUT-OF-BAND EMISSIONS.....	36
3.7. ANTENNA REQUIREMENT	37
4. TEST SETUP PHOTOS OF THE EUT	38
5. PHOTOS OF THE EUT	39

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 22/EN 55022 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	$\pm 1.9\%$	(1)
Maximum Conducted Output Power	± 1.18 dB	(1)
Maximum Power Spectral Density Level	± 0.98 dB	(1)
Band-edge	± 1.21 dB	(1)
Unwanted Emissions In Non-restricted Freq Bands	9kHz-7GHz: ± 1.09 dB 7GHz-26.5GHz: ± 3.27 dB	(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.
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
2.4G WIFI	
Supported type:	802.11b/802.11g/802.11n(H20)/802.11n(H40)
Modulation:	802.11b: DSSS 802.11g/802.11n(H20)/802.11n(H40): OFDM
Operation frequency:	802.11b/802.11g/802.11n(H20): 2412MHz~2462MHz 802.11n(H40): 2422MHz~2452MHz
Channel number:	802.11b/802.11g/802.11n(H20): 11 802.11n(H40): 7
Channel separation:	5MHz
Antenna type:	PCB Antenna
Antenna gain:	3.37dBi

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 (EspRFTTestTool_v3.6) to control the EUT for staying in continuous transmitting and receiving mode for testing.

There are 11 channels provided to the EUT and Channel 01/06/11 were selected for 802.11b/802.11g/802.11n(H2T0)/test. Channel 03/06/09 were selected for 802.11n(HT40) test.

Operation Frequency WIFI :

Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432		
6	2437		
7	2442		

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

Data Rate Used during the test:

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate	Channel
Maximum Conducted Output Power Power Spectral Density 6dB Bandwidth Spurious RF conducted emission Radiated Emission 9kHz~1GHz& Radiated Emission 1GHz~10th Harmonic	11b/DSSS	1 Mbps	1/6/11
	11g/OFDM	6 Mbps	1/6/11
	11n(20MHz)/OFDM	6.5Mbps	1/6/11
	11n(40MHz)/OFDM	13.5Mbps	3/6/9
Band Edge	11b/DSSS	1 Mbps	1/11
	11g/OFDM	6 Mbps	1/11
	11n(20MHz)/OFDM	6.5Mbps	1/11
	11n(40MHz)/OFDM	13.5Mbps	3/9

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	EspRFTTestTool_v3.6		
Frequency	2412/2422MHz	2437MHz	2452/2462MHz
802.11b	Default	Default	Default
802.11g	Default	Default	Default
802.11n(HT20)	Default	Default	Default
802.11n(HT40)	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_EMG(Below 1GHz)			V1.1.4.2		
EZ_EMG(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

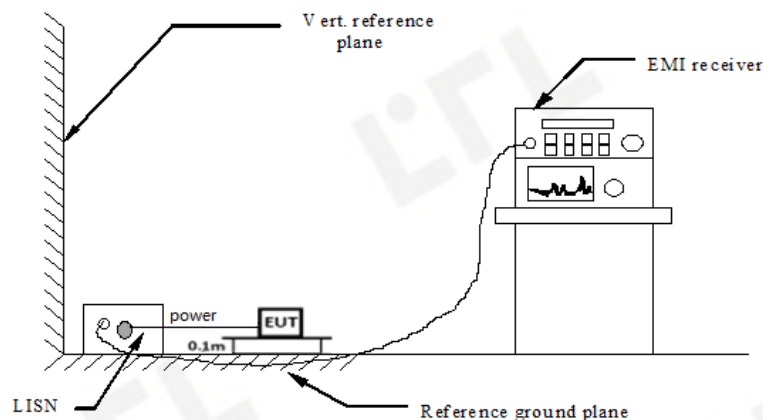
LIMIT

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



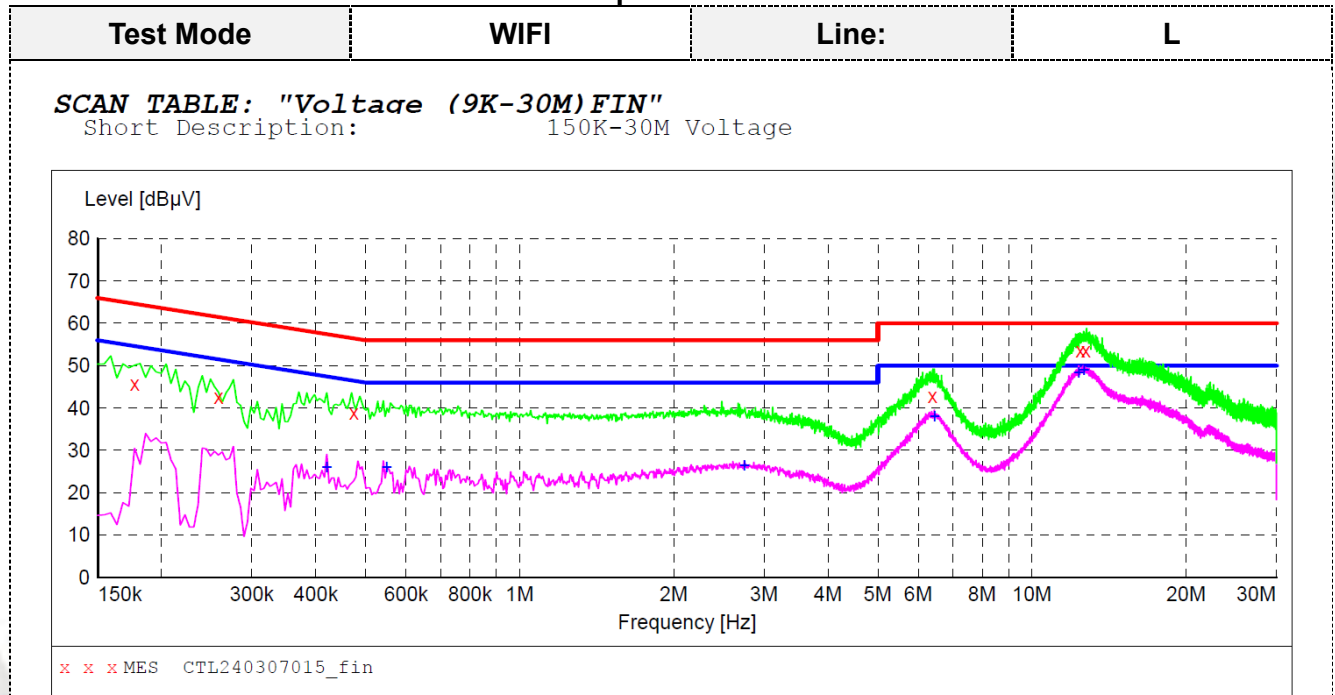
TEST PROCEDURE

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 :

1. Pre-scan all modes of IEEE 802.11b/g/n(HT20)/n(HT40) at Low, Middle, and High channel; only the worst result of was reported as below:
2. 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:

Model: Aiper Scuba S1 Pro**MEASUREMENT RESULT: "CTL240307015_fin"**

3/7/2024 9:49AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.177000	45.80	10.0	65	18.8	QP	L1	GND
0.258000	42.50	10.0	62	19.0	QP	L1	GND
0.474000	38.80	10.0	56	17.6	QP	L1	GND
6.391500	42.80	10.3	60	17.2	QP	L1	GND
12.426000	53.50	10.9	60	6.5	QP	L1	GND
12.745500	53.50	10.9	60	6.5	QP	L1	GND

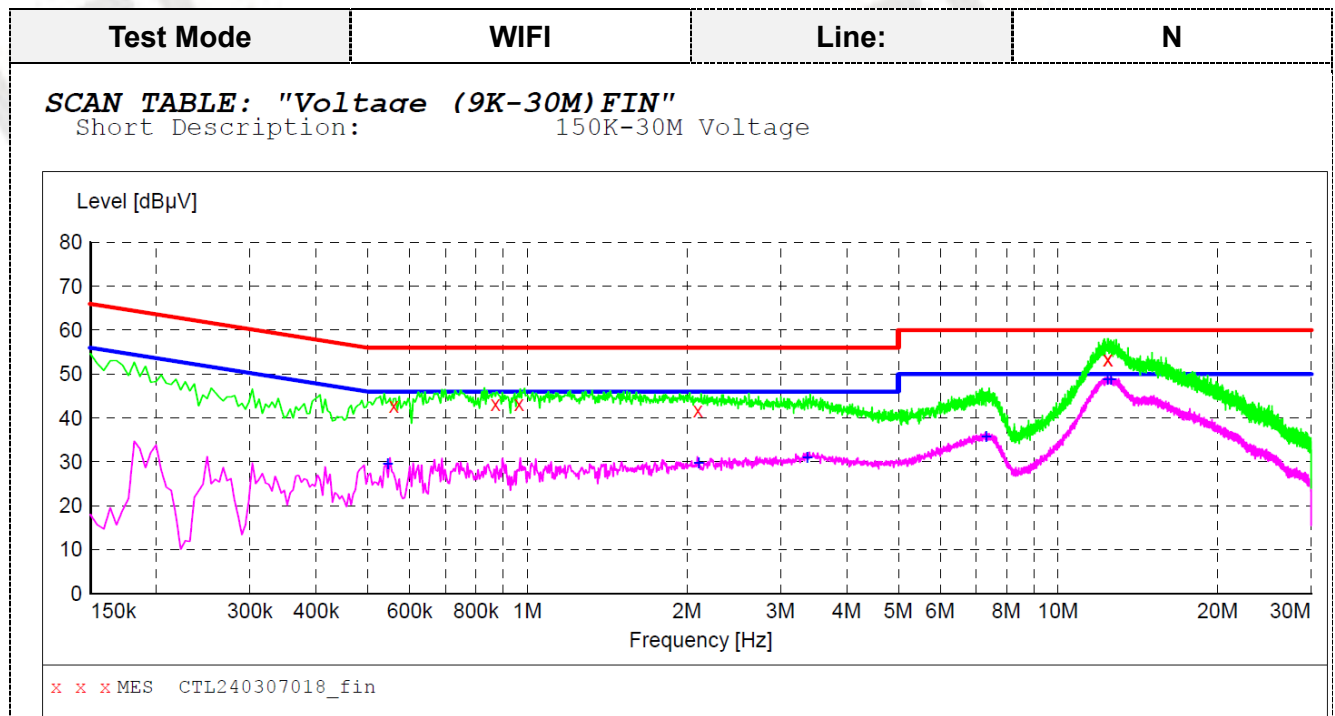
MEASUREMENT RESULT: "CTL240307015_fin2"

3/7/2024 9:49AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.420000	26.00	10.0	47	21.4	AV	L1	GND
0.550500	25.90	10.0	46	20.1	AV	L1	GND
2.746500	26.40	10.1	46	19.6	AV	L1	GND
6.454500	38.10	10.3	50	11.9	AV	L1	GND
12.345000	48.40	10.9	50	1.6	AV	L1	GND
12.637500	48.90	10.9	50	1.1	AV	L1	GND

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

Margin=Limit(dBuV)- Level(dBuV)

**MEASUREMENT RESULT: "CTL240307018_fin"**

3/7/2024 9:58AM

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.559500	42.80	10.0	56	13.2	QP	N	GND
0.870000	43.20	10.1	56	12.8	QP	N	GND
0.964500	43.30	10.1	56	12.7	QP	N	GND
2.094000	41.70	10.1	56	14.3	QP	N	GND
12.399000	53.40	10.9	60	6.6	QP	N	GND
12.430500	53.30	10.9	60	6.7	QP	N	GND

MEASUREMENT RESULT: "CTL240307018_fin2"

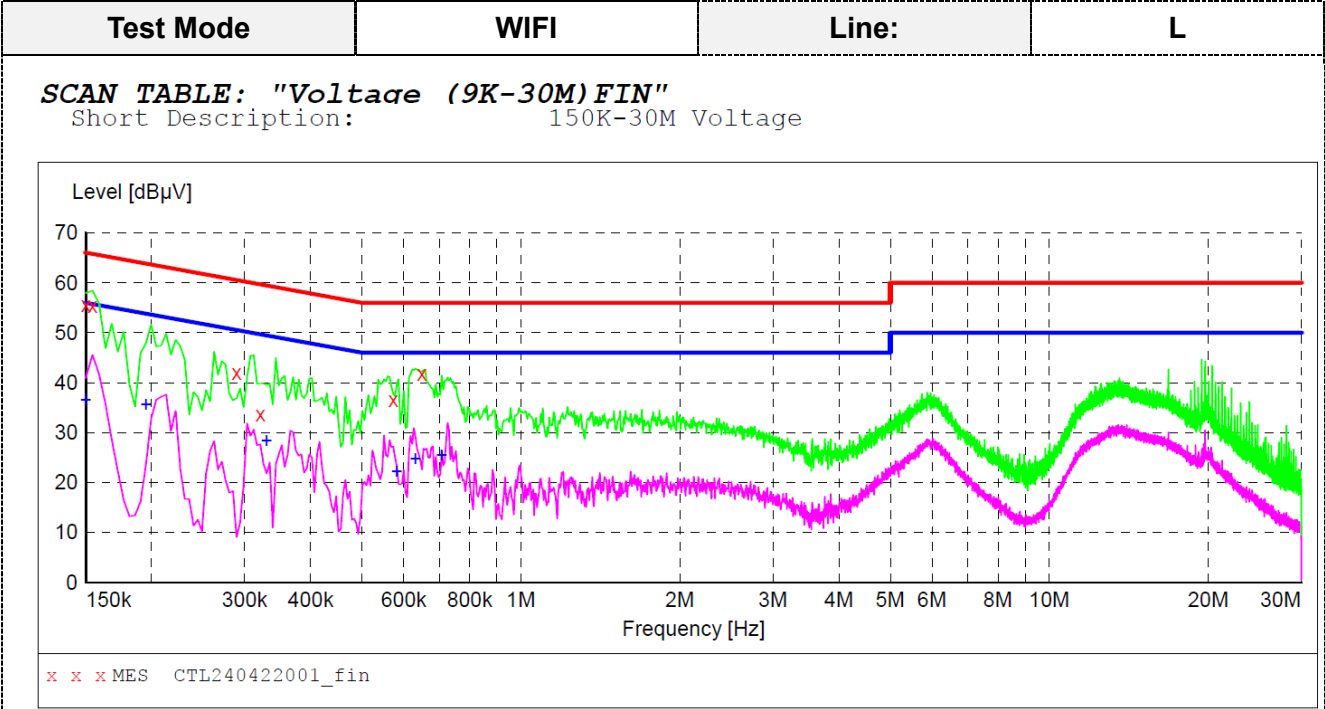
3/7/2024 9:58AM

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.546000	29.60	10.0	46	16.4	AV	N	GND
2.103000	29.70	10.1	46	16.3	AV	N	GND
3.367500	31.10	10.1	46	14.9	AV	N	GND
7.327500	35.70	10.4	50	14.3	AV	N	GND
12.399000	48.70	10.9	50	1.3	AV	N	GND
12.583500	48.70	10.9	50	1.3	AV	N	GND

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

Margin=Limit(dBuV)- Level(dBuV)

Model: Aiper Scuba N1 Ultra



MEASUREMENT RESULT: "CTL240422001_fin"

4/22/2024 9:17AM

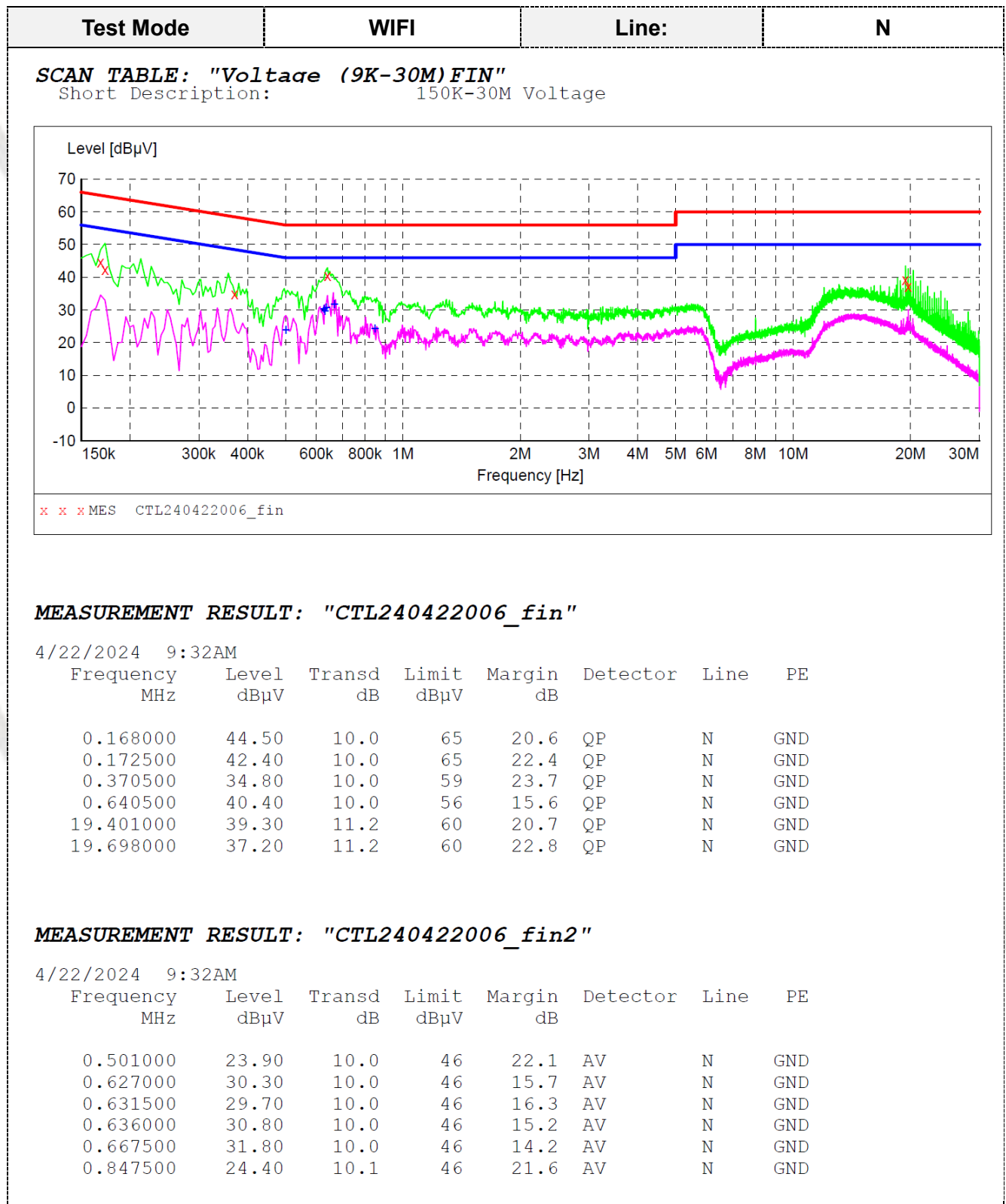
Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.150000	55.60	10.0	66	10.4	QP	L1	GND
0.154500	55.40	10.0	66	10.4	QP	L1	GND
0.289500	42.00	10.0	61	18.5	QP	L1	GND
0.321000	33.70	10.0	60	26.0	QP	L1	GND
0.573000	36.50	10.0	56	19.5	QP	L1	GND
0.649500	41.80	10.0	56	14.2	QP	L1	GND

MEASUREMENT RESULT: "CTL240422001_fin2"

4/22/2024 9:17AM

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.150000	36.60	10.0	56	19.4	AV	L1	GND
0.195000	35.70	10.0	54	18.1	AV	L1	GND
0.330000	28.30	10.0	50	21.2	AV	L1	GND
0.582000	22.30	10.0	46	23.7	AV	L1	GND
0.631500	24.70	10.0	46	21.3	AV	L1	GND
0.708000	25.50	10.0	46	20.5	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

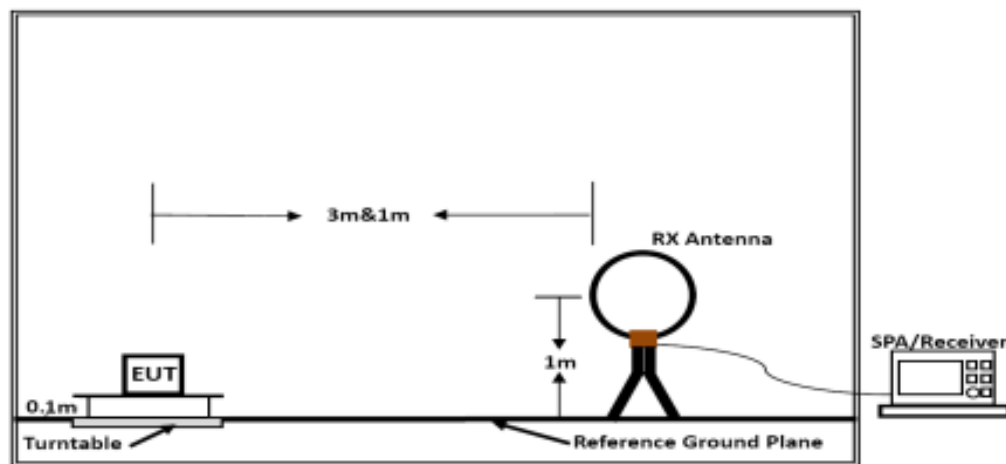
Unwanted emissions that fall into restricted bands shall comply with the limits specified in RSS-Gen; and Unwanted emissions that do not fall within the restricted frequency bands shall comply either with the limits specified in the applicable RSS or with those specified in this RSS-Gen.

Radiated emission limits

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/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

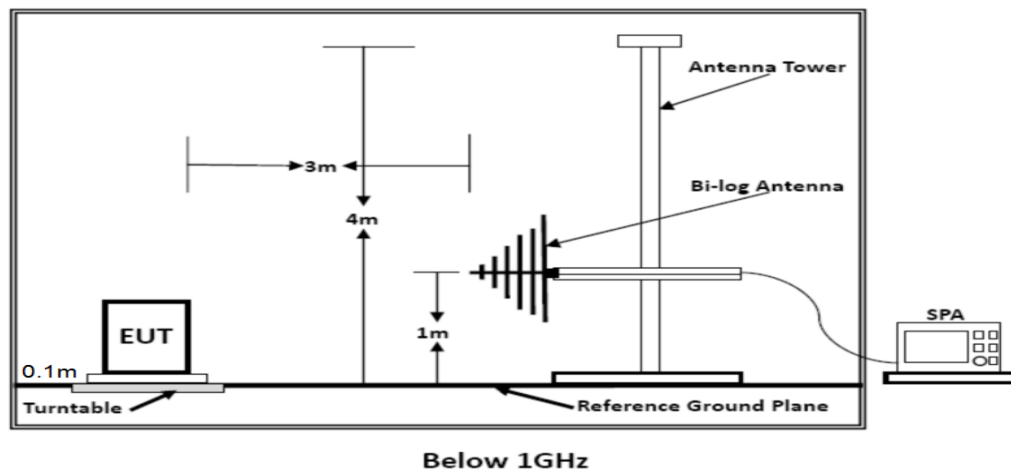
TEST CONFIGURATION

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

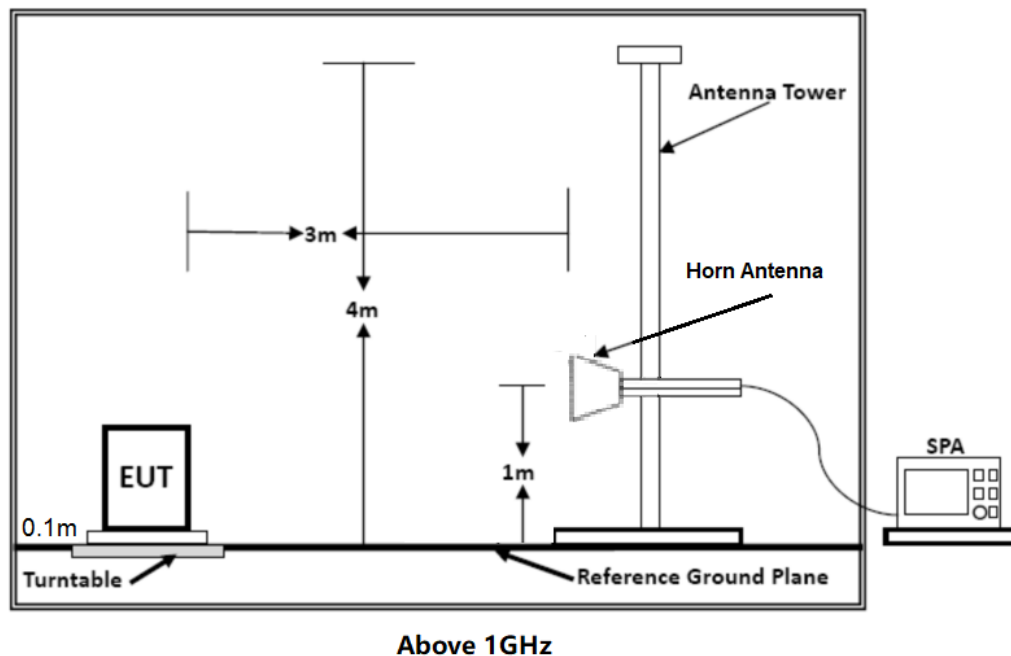


Below 30MHz

(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° to 360° 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 Antennna	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

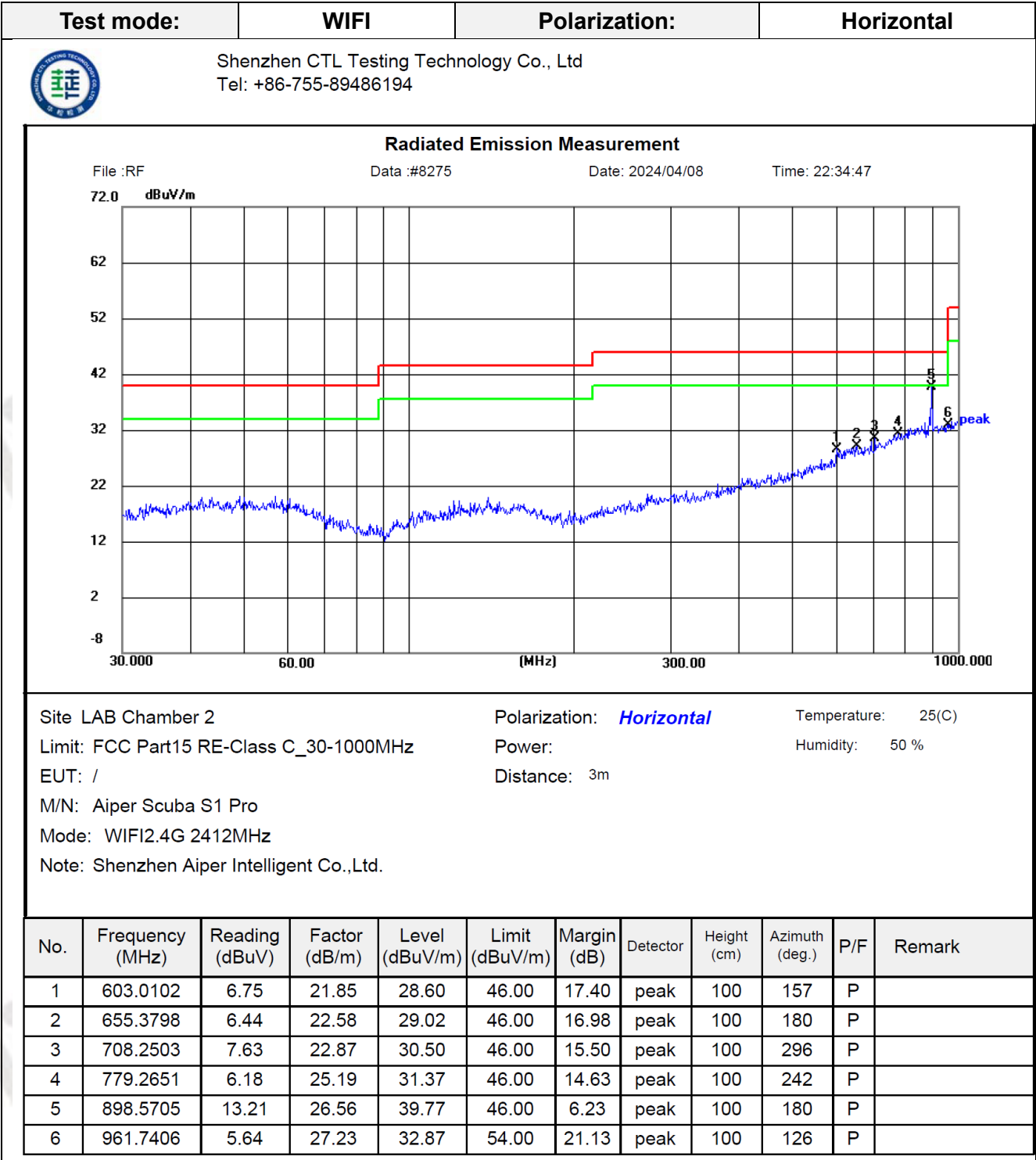
TEST RESULTS

Remark:

1. All three channels (lowest/middle/highest) of each mode were measured below 1GHz and recorded worst case at 802.11b low channel.
2. All three channels (lowest/middle/highest) of each mode were measured above1GHz and recorded worst case at 802.11b mode.
3. 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 recorded in report.

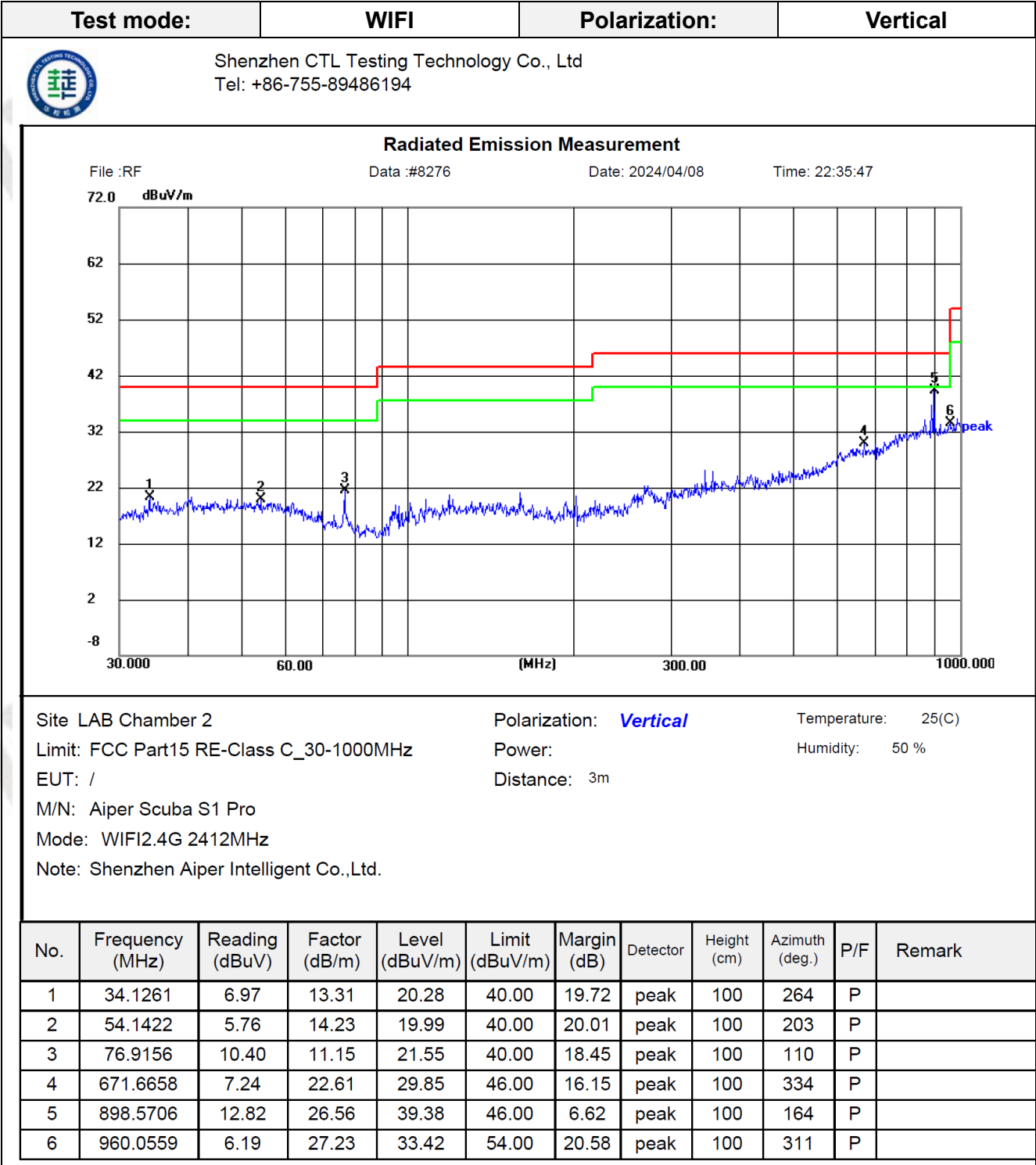
For 30MHz-1GHz

Model: Aiper Scuba S1 Pro



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

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



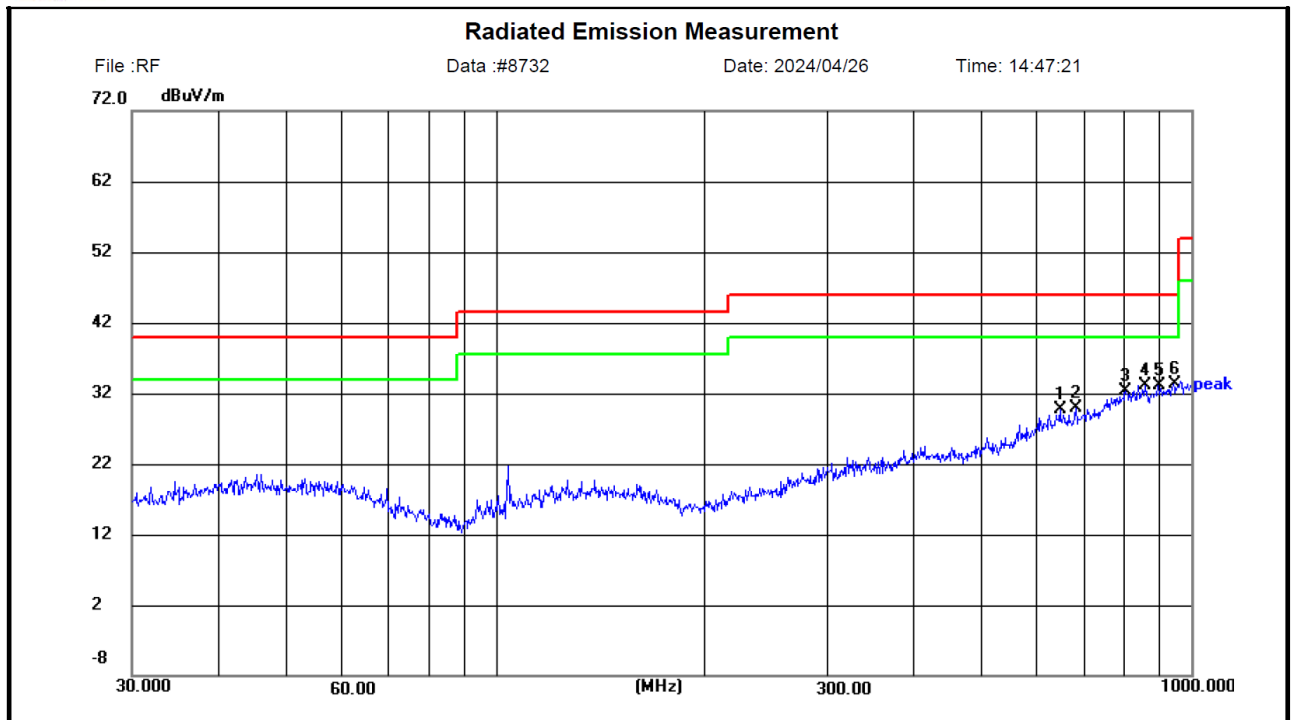
Remark: Level(dBuV/m)=Reading(dBuV)+Factor(dB/m)
Margin= Limit(dBuV/m)- Level(dBuV/m)

Model: Aiper Scuba N1 Ultra

Test mode:	WIFI	Polarization:	Horizontal
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Shenzhen CTL Testing Technology Co., Ltd
Tel: +86-755-89486194



Site LAB Chamber 2

Limit: FCC Part15 RE-Class C_30-1000MHz

EUT: /

M/N: Aiper Scuba N1 Ultra

Mode: WIFI2.4G 2412MHz

Note: Shenzhen Aiper Intelligent Co.,Ltd.

Polarization: *Horizontal*

Power:

Distance: 3m

Temperature: 25(C)

Humidity: 50 %

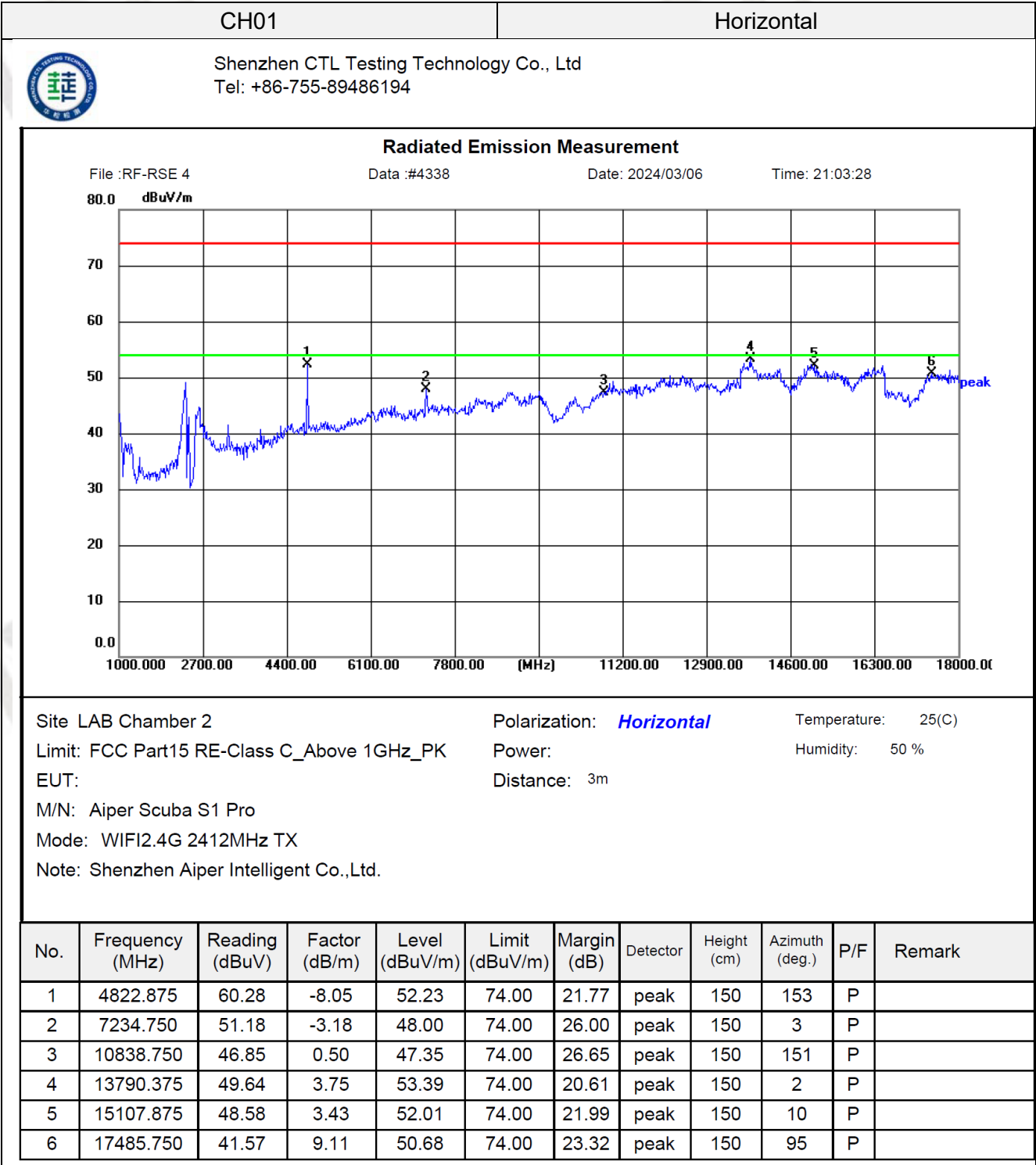
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	649.0904	7.17	22.57	29.74	46.00	16.26	peak	100	59	P	
2	684.7453	7.23	22.73	29.96	46.00	16.04	peak	100	222	P	
3	806.3680	6.69	25.70	32.39	46.00	13.61	peak	100	268	P	
4	858.1523	6.84	26.34	33.18	46.00	12.82	peak	100	292	P	
5	899.7529	6.56	26.61	33.17	46.00	12.83	peak	100	274	P	
6	943.7837	6.29	27.10	33.39	46.00	12.61	peak	100	353	P	

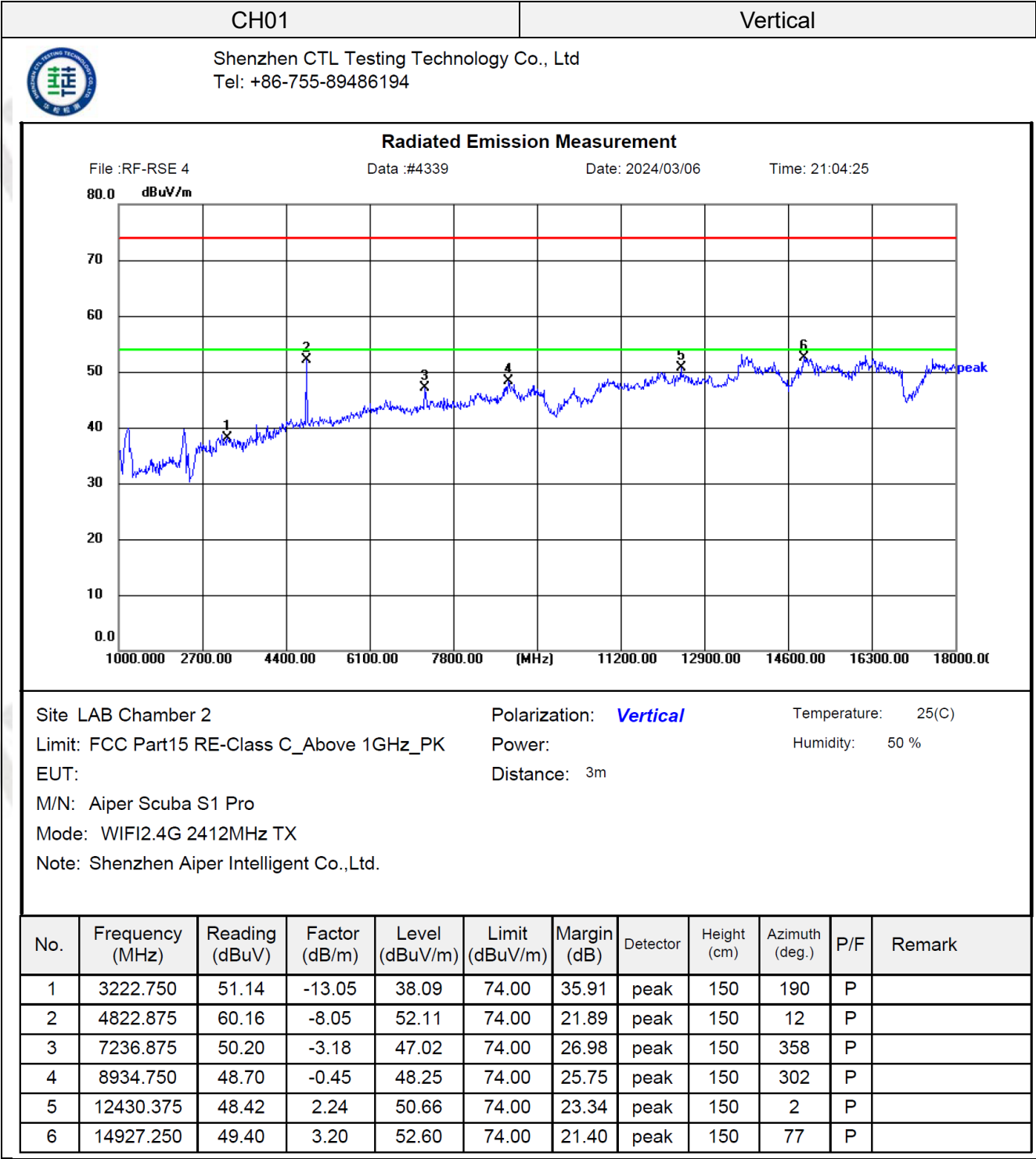
Remark: $\text{Level(dBuV/m)} = \text{Reading(dBuV)} + \text{Factor(dB/m)}$

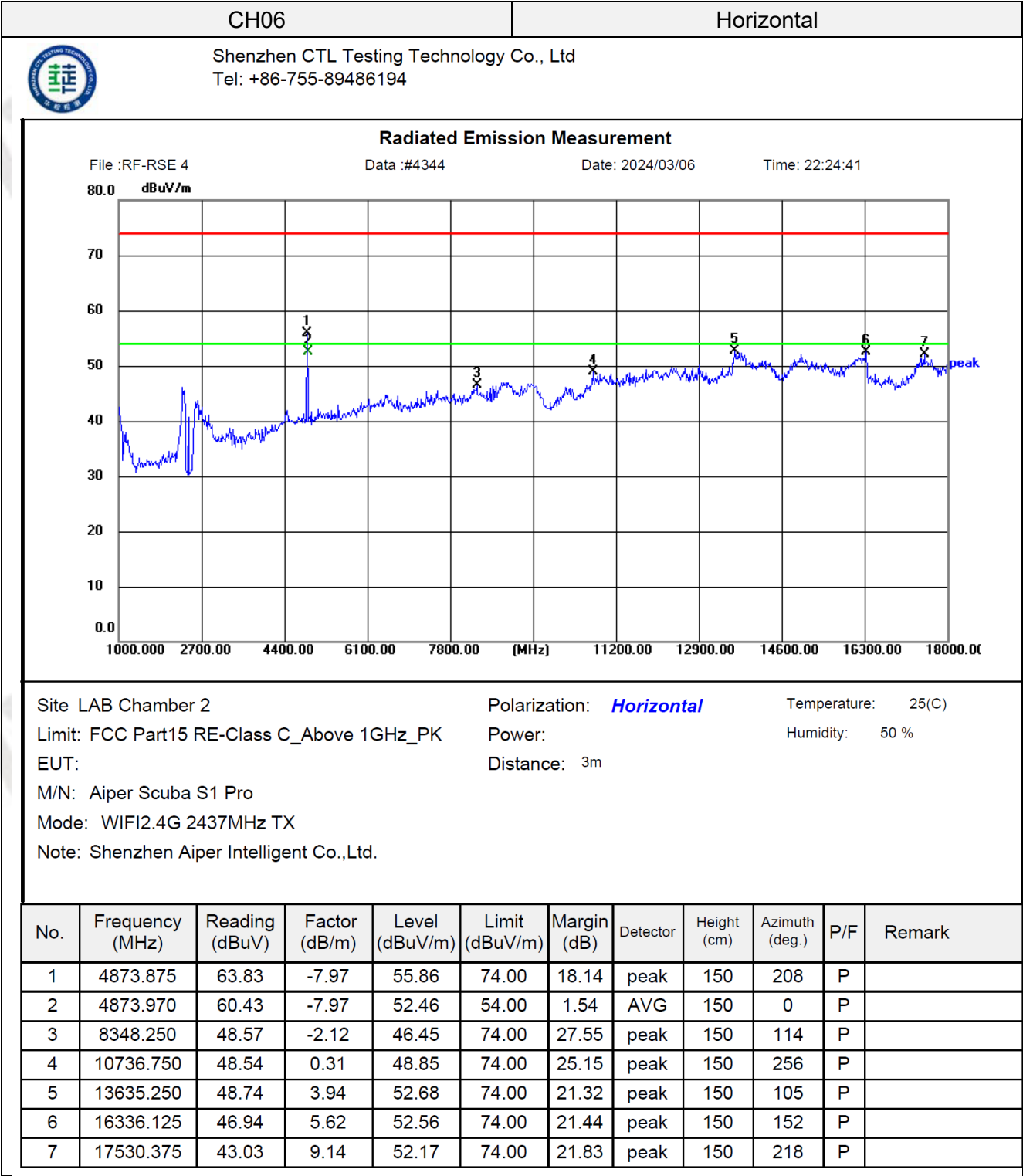
$$\text{Margin} = \text{Limit(dBuV/m)} - \text{Level(dBuV/m)}$$

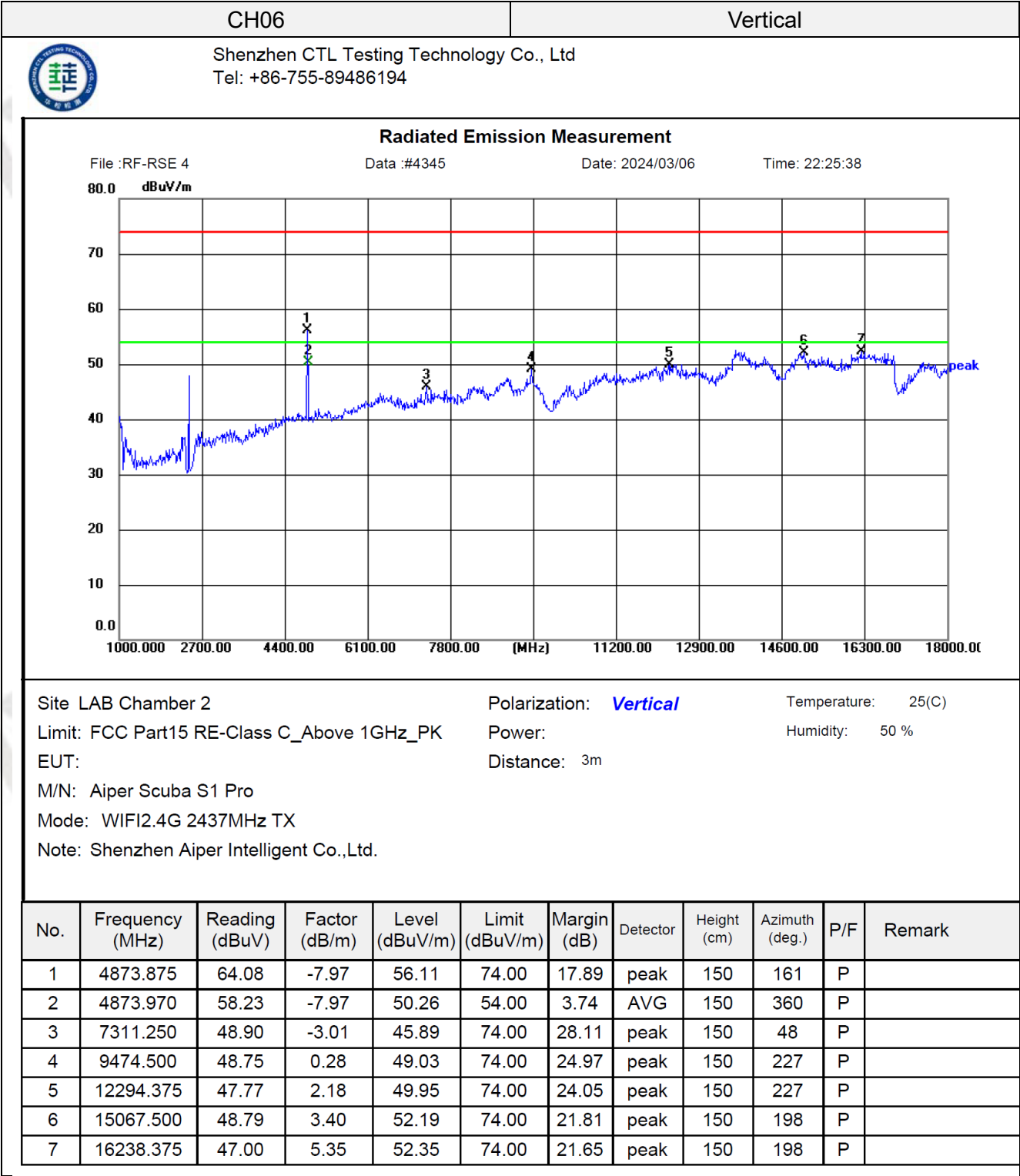
For 1GHz to 25GHz

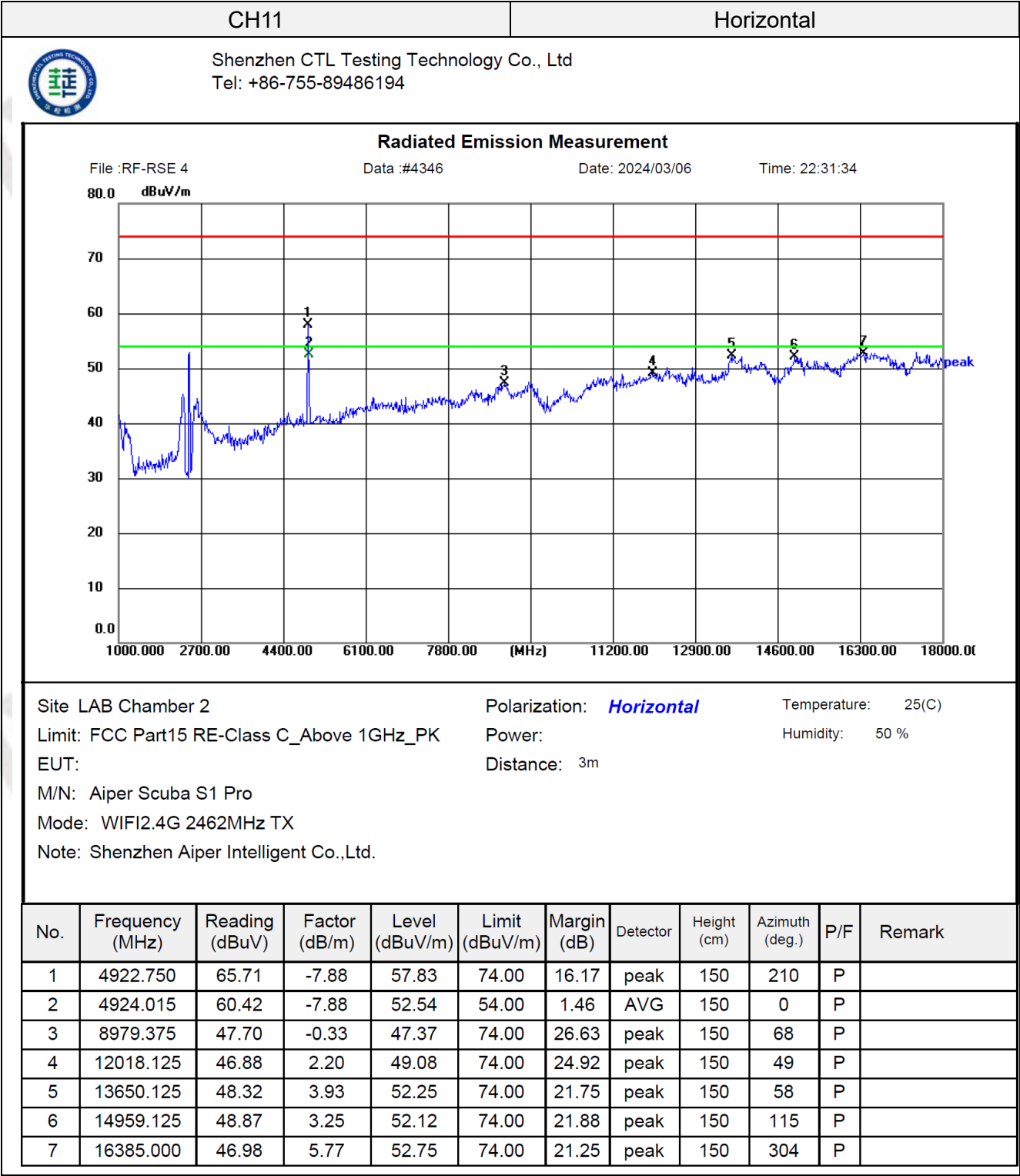
Note: 802.11b/802.11g/802.11n (H20) /802.11n (H40) all have been tested, only worse case 802.11b is reported

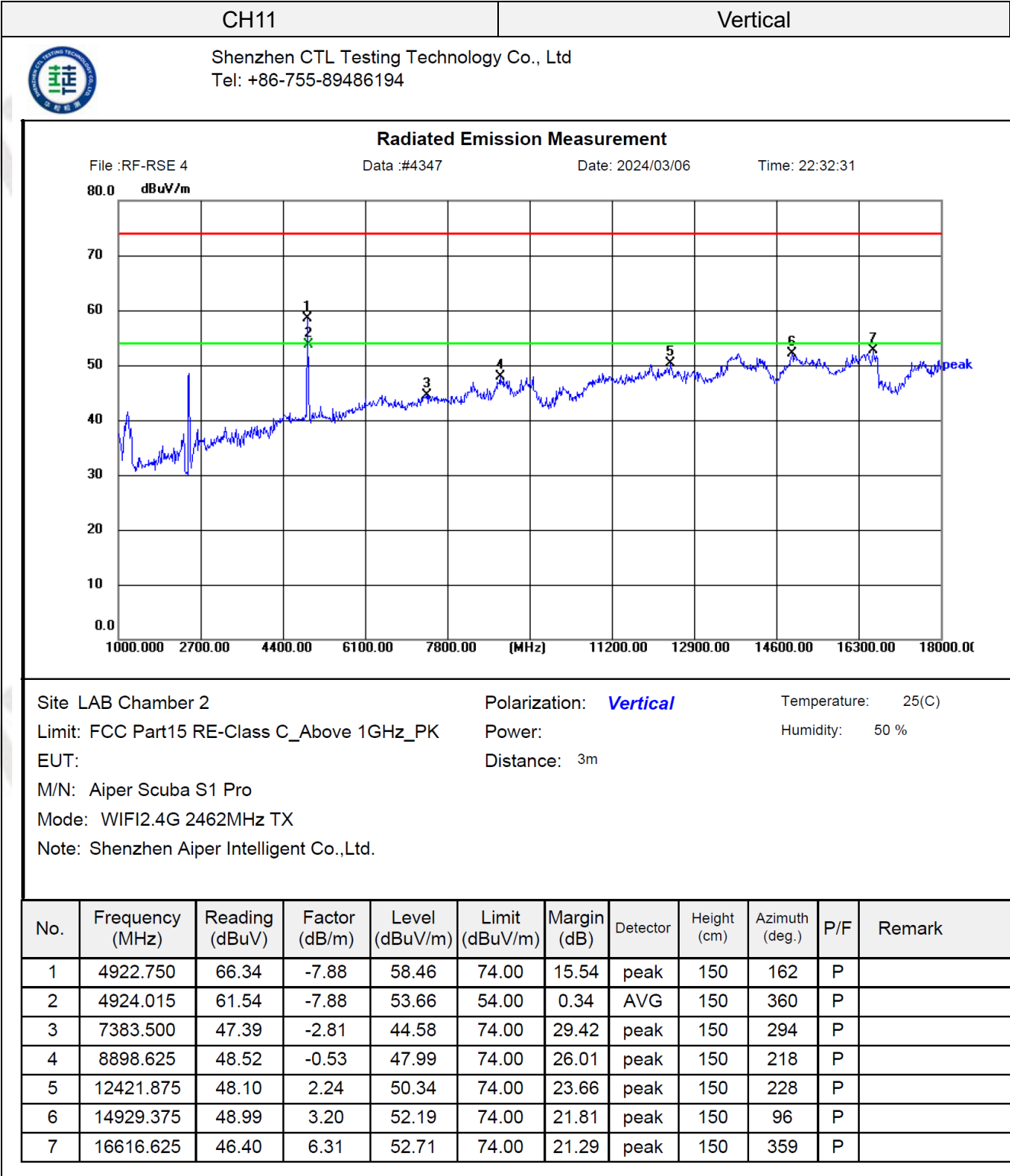










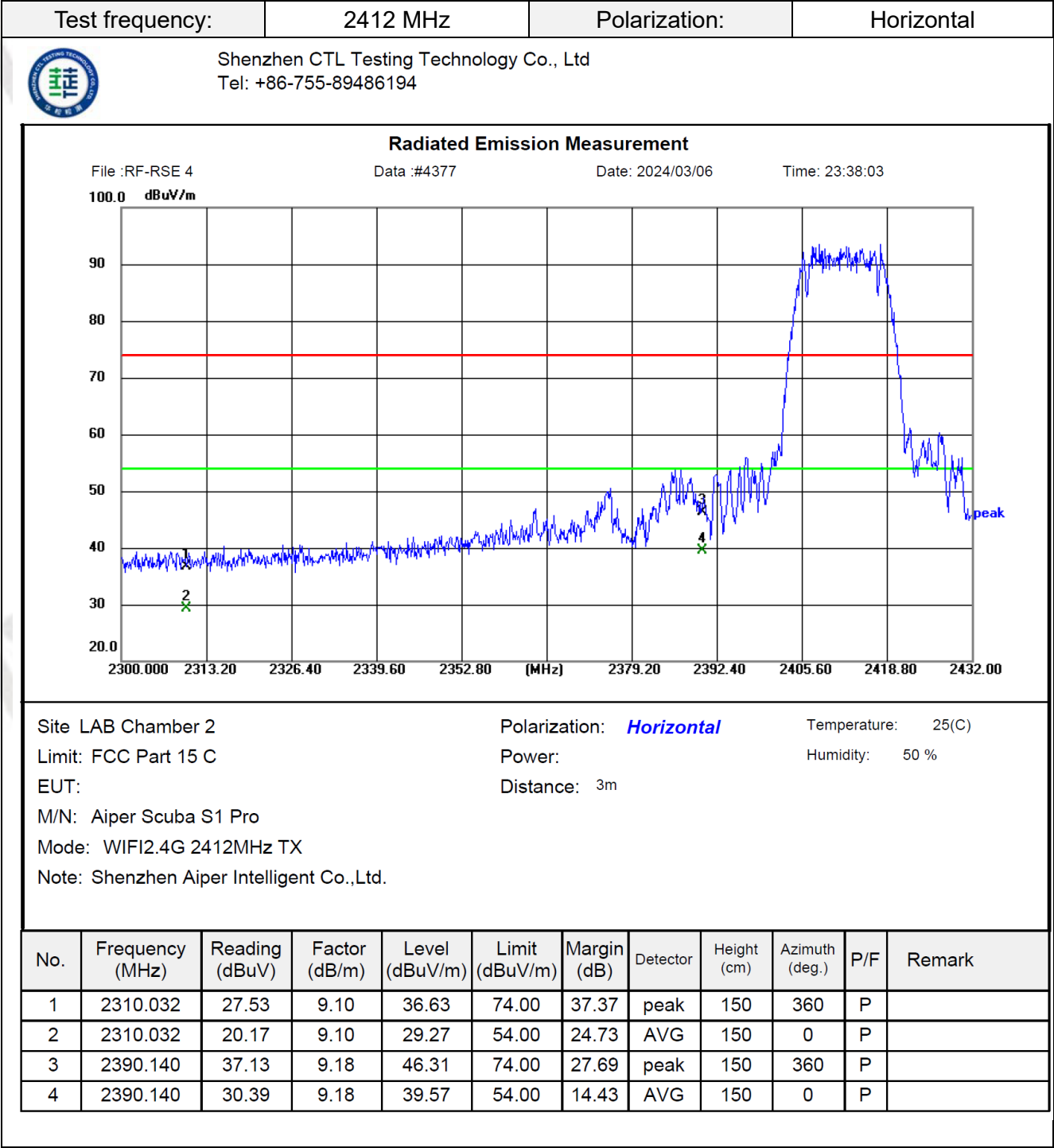


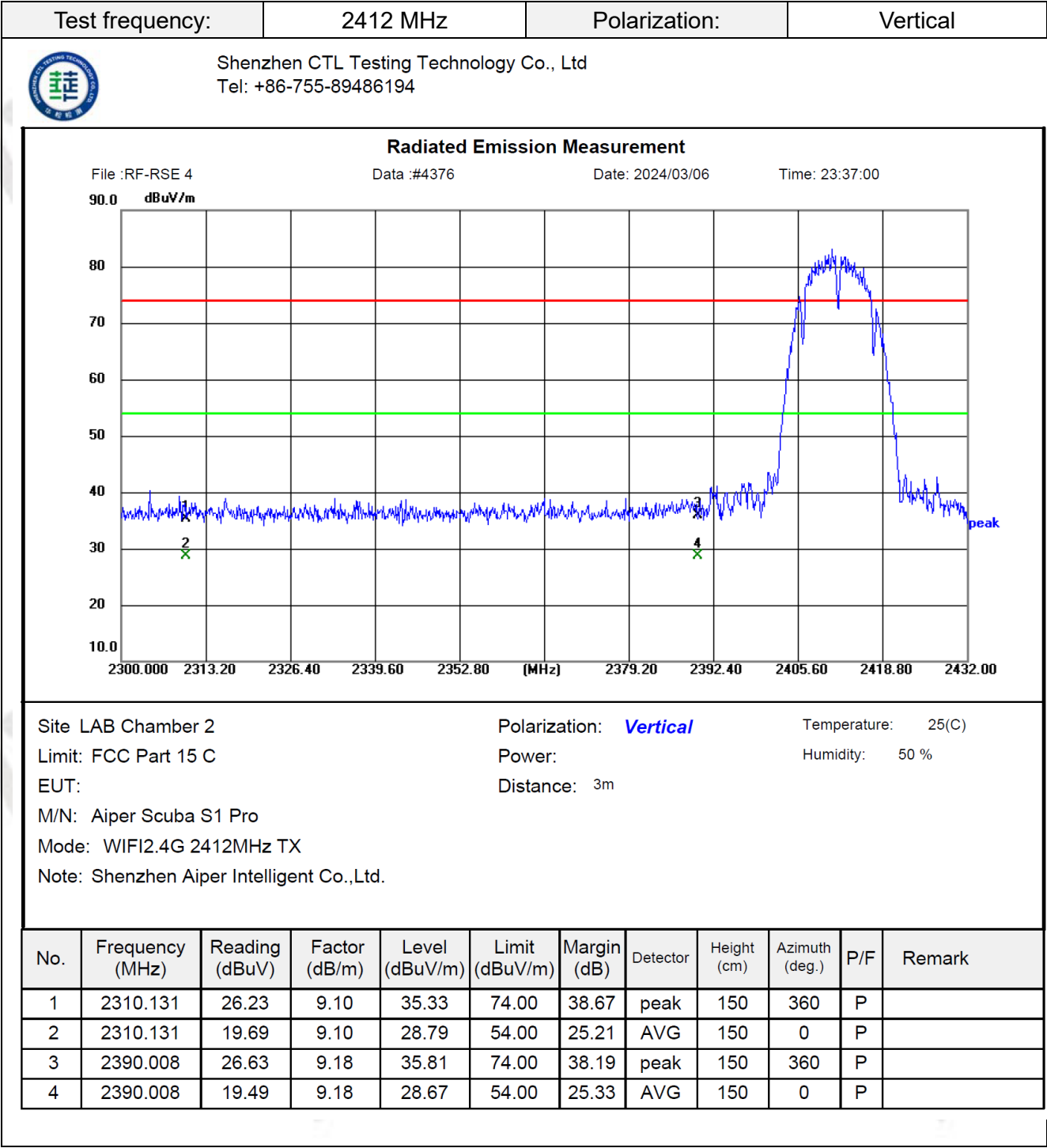
REMARKS:

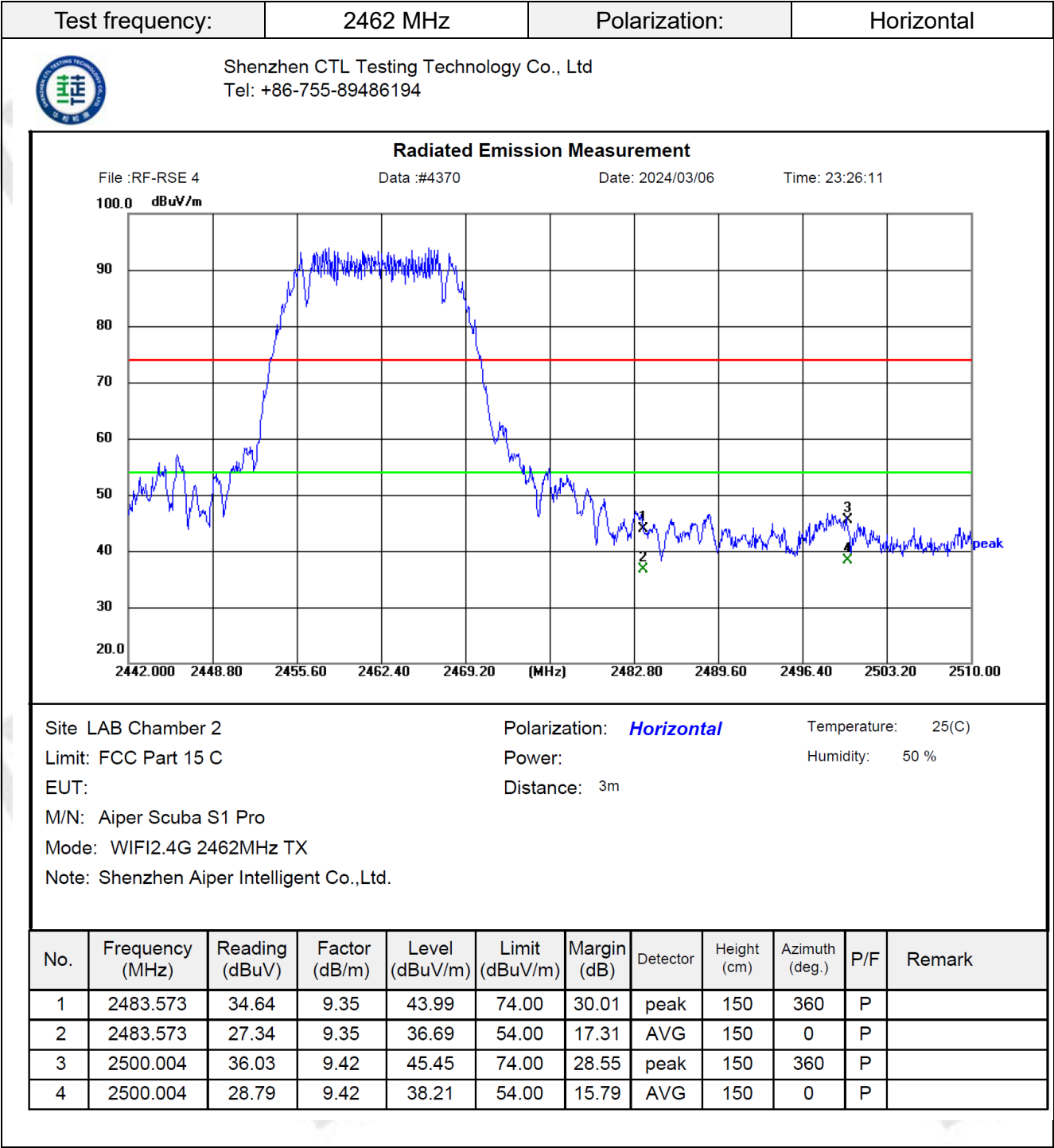
1. Level (dBuV/m) =Reading (dBuV)+ Factor (dB/m).
2. Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor.
3. Margin value = Limit(dBuV/m)- Level(dBuV/m).
4. PK detector measurement value is lower than the average limit. Therefore, there is no need to test AV detector measurements.
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.

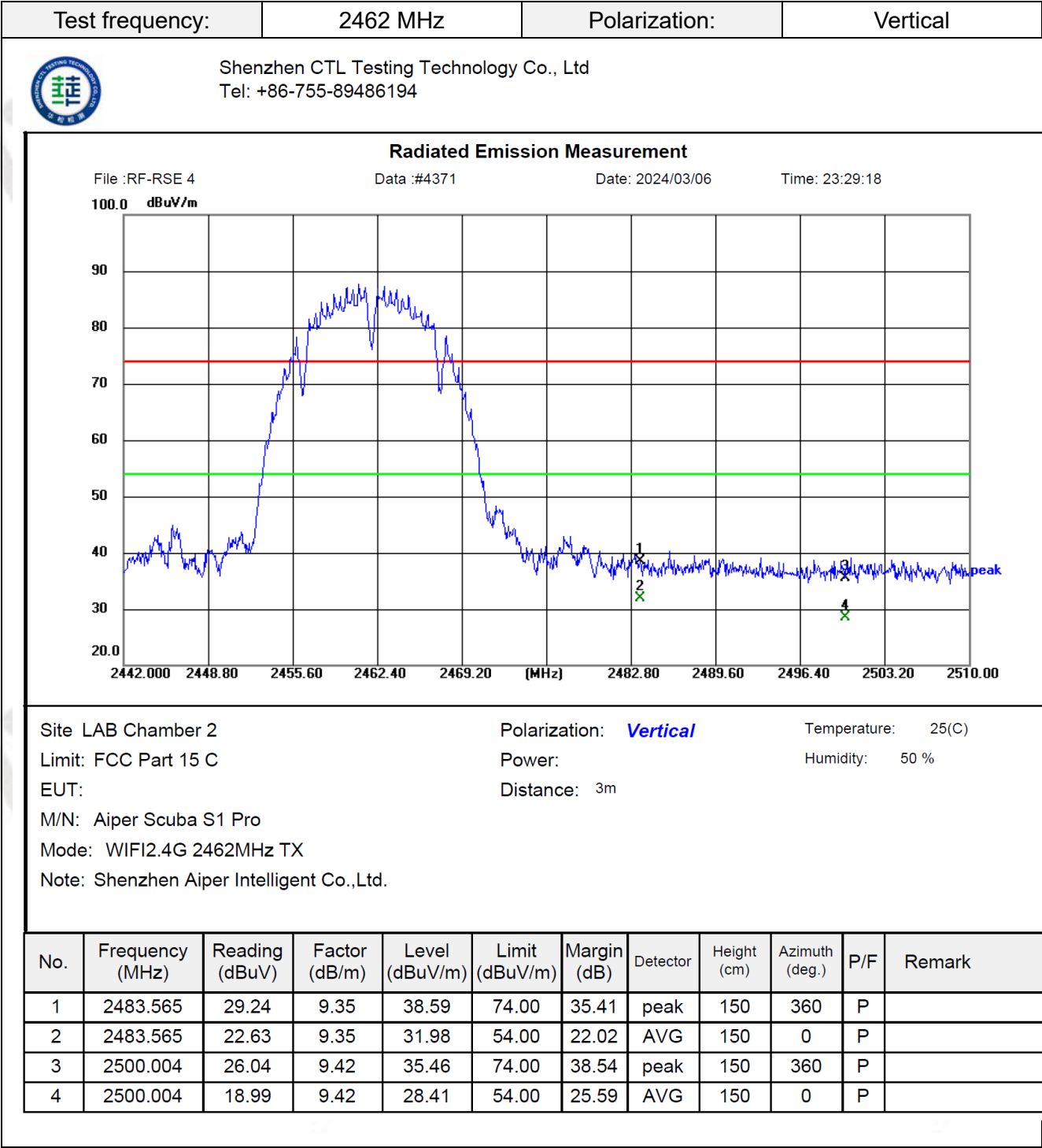
Results of Band Edges Test (Radiated)

Note: 802.11b/802.11g/802.11n (H20) /802.11n (H40) all have been tested, only worse case 802.11802.11b is reported.









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 Conducted Output Power

Limit

The Maximum Peak Output Power Measurement is 30dBm.

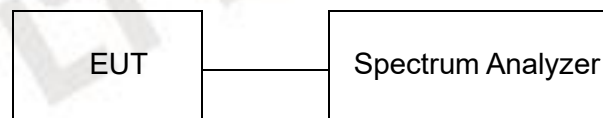
Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum. Use ANSI C63.10: 2013 output power measurement method AVGSA-1 to perform the measurement.

The procedure for this method is as follows:

- a) Set span to at least 1.5 times the OBW.
- b) Set RBW = 1% to 5% of the OBW, not to exceed 1 MHz.
- c) Set VBW $\geq 3 \times$ RBW.
- d) Number of points in sweep $\geq [2 \times \text{span} / \text{RBW}]$. (This gives bin-to-bin spacing $_ \text{RBW} / 2$, so that narrowband signals are not lost between frequency bins.)
- e) Sweep time = auto.
- f) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
- g) If transmit duty cycle $< 98\%$, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at the maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no OFF intervals) or at duty cycle $\geq 98\%$, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run".
- h) Trace average at least 100 traces in power averaging (rms) mode.
- i) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

Test Configuration



Test Results

Raw data reference to Appendix RF test data for WIFI2.4G.

3.4. Power Spectral Density

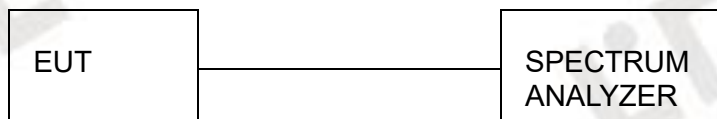
Limit

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

Test Configuration



Test Results

Raw data reference to Appendix RF test data for WIFI2.4G.

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 WIFI2.4G.

3.6. Out-of-band Emissions

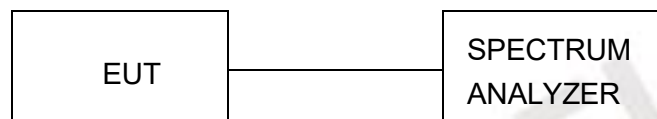
Limit

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 settings are made of the in-band reference level, band edge and out-of-band emissions.

Test Configuration



Test Results

Raw data reference to Appendix RF test data for WIFI2.4G.

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

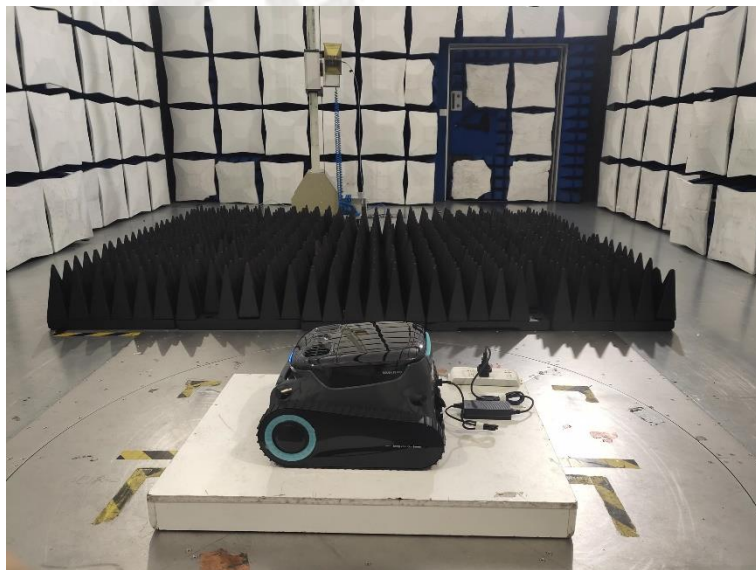
FCC CFR Title 47 Part 15 Subpart C Section 15.247(b) (4):

(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

Reference to the test report No. CTL2402267012-WF01

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