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TEST REPORT

FCC PART 15.247

Report Reference No. ..... : **CTL2404037071-WF02**

Compiled by: (position+printed name+signature)	Happy Guo (File administrators)	Happy Guo
Tested by: (position+printed name+signature)	Yapeng Jin (Test Engineer)	Yapeng Jin
Approved by: (position+printed name+signature)	Ivan Xie (Manager)	Ivan Xie

Product Name ..... :	Robotic Pool Cleaner
Model/Type reference ..... :	Aiper Scuba S1
List Model(s)..... :	Scuba S1, Aiper Scuba N1, Scuba N1
Trade Mark..... :	Aiper
FCC ID..... :	**2BD5N-SCUBAS1N1**
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 ..... :	Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055
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 ..... :	Apr. 08, 2024
Date of Test Date..... :	Apr. 08, 2024-Apr. 18, 2024
Date of Issue ..... :	Apr. 19, 2024
Result..... :	**Pass**

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TEST REPORT

Test Report No. :	CTL2404037071-WF02	Apr. 19, 2024 Date of issue

Equipment under Test	:	Robotic Pool Cleaner
Sample No	:	CTL2404037071
Model /Type	:	Aiper Scuba S1
Listed Models	:	Scuba S1, Aiper Scuba N1, Scuba N1
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 ***

∗ 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 **

Revisions	Description	Issued Data	Report No.	Remark
Version 1.0	Initial Test Report Release	2024-04-19	CTL2404037071-WF02	Tracy Qi

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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

KDB 558074 D01 v05r02: KDB558074 D01 15.247 Meas Guidance v05r02

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 Conducted Output Power	PASS
FCC Part 15.247(e)	Power Spectral Density	PASS
FCC Part 15.109/ 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.
Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055

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.

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.

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 conducted	±0.57 dB	(1)
Transmitter power Radiated	±2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	±2.20 dB	(1)
Occupied Bandwidth	±0.01ppm	(1)
Radiated Emission9KHz~30MHz	±3.66dB	(1)
Radiated Emission 30~1000MHz	±4.10dB	(1)
Radiated Emission Above 1GHz	±4.32dB	(1)
20dB Emission Bandwidth	±1.9%	(1)
Carrier Frequency Separation	±1.9%	(1)
Maximum Power Spectral Density Level	±0.98 dB	(1)
Number of Hopping Channel	±1.9%	(1)
Time of Occupancy	±0.11%	(1)
Max Peak Conducted Output Power	±0.98 dB	(1)
Band-edge Spurious Emission	±1.21dB	(1)
Conducted RF Spurious Emission	9kHz-7GHz:±1.09dB 7GHz-26.5GHz: ±3.27dB	(1)
Conducted Disturbance0.15~30MHz	±2.96dB	(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 SKIMMER
Model/Type reference:	Aiper Scuba S1
Power supply:	AC100-240V~ 50/60Hz 1.1A from adapter or DC 14.4V from battery
Adapter 1	Model: GC42-168260-1A Input: 100-240V~50/60Hz 1.5A Outputi: 16.8V ⎓ 2.6A
Adapter 2	Model: E044-1A168260HU Input: 100-240V~50/60Hz 1.1A Outputi: 16.8V ⎓ 2.6A
2.4G WIFI	
Supported type:	802.11b/802.11g/802.11n(H20)
Modulation:	802.11b: DSSS 802.11g/802.11n(H20): OFDM
Operation frequency:	802.11b/802.11g/802.11n(H20): 2412MHz~2462MHz
Channel number:	802.11b/802.11g/802.11n(H20): 11
Channel separation:	5MHz
Antenna type:	PCB Antenna
Antenna gain:	4.16dBi

Note1: For more details, please refer to the user's manual of the EUT.
Note2: Antenna gain provided by the applicant.

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 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.

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:

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
Band Edge	11b/DSSS	1 Mbps	1/11
	11g/OFDM	6 Mbps	1/11
	11n(20MHz)/OFDM	6.5Mbps	1/11

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	2412/2422MHz	2437MHz	2452/2462MHz
802.11b	Default	Default	Default
802.11g	Default	Default	Default
802.11n(HT20)	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

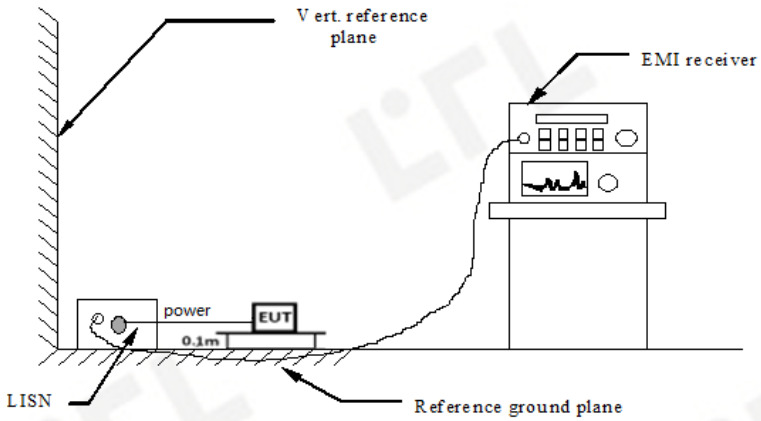
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207

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 a landing 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

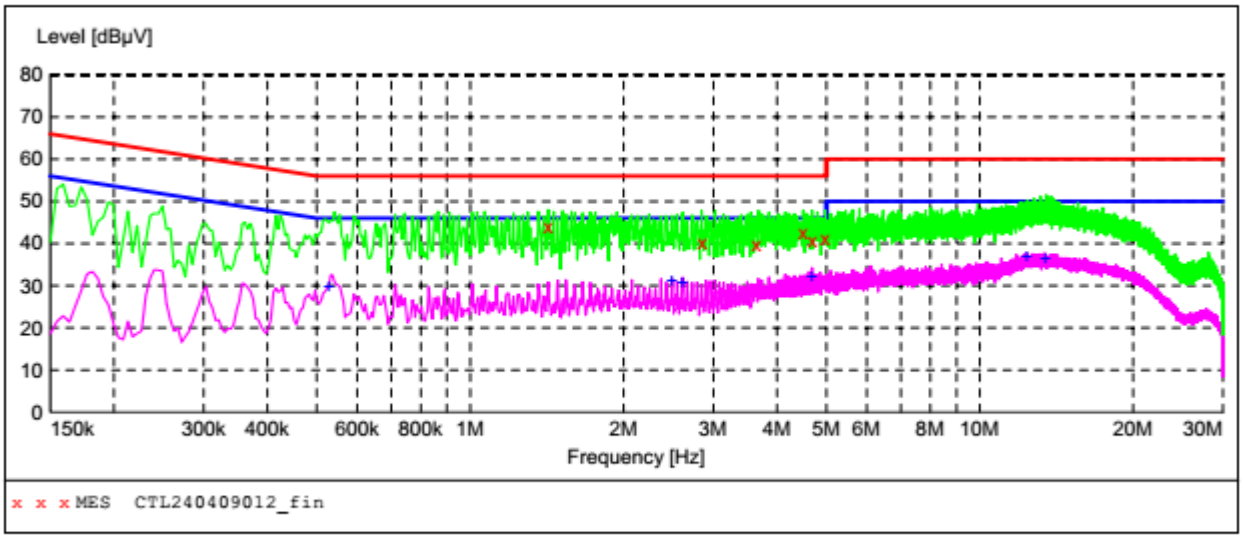
Note:

1. Pre-scan all modes of IEE 802.11b/g/n(HT20) 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:

Test Mode	WIFI	Line:	L
Adapter 1			

SCAN TABLE: "Voltage (9K-30M)FIN"

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL240409012_fin"

4/9/2024 9:40AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
1.423500	43.80	10.1	56	12.2	QP	L1	GND
2.854500	40.00	10.1	56	16.0	QP	L1	GND
3.651000	39.60	10.1	56	16.4	QP	L1	GND
4.506000	42.50	10.1	56	13.5	QP	L1	GND
4.690500	40.80	10.1	56	15.2	QP	L1	GND
4.978500	41.40	10.1	56	14.6	QP	L1	GND

MEASUREMENT RESULT: "CTL240409012_fin2"

4/9/2024 9:40AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.528000	30.00	10.0	46	16.0	AV	L1	GND
2.490000	31.00	10.1	46	15.0	AV	L1	GND
2.611500	30.70	10.1	46	15.3	AV	L1	GND
4.686000	32.30	10.1	46	13.7	AV	L1	GND
12.394500	36.80	10.9	50	13.2	AV	L1	GND
13.456500	36.40	11.0	50	13.6	AV	L1	GND

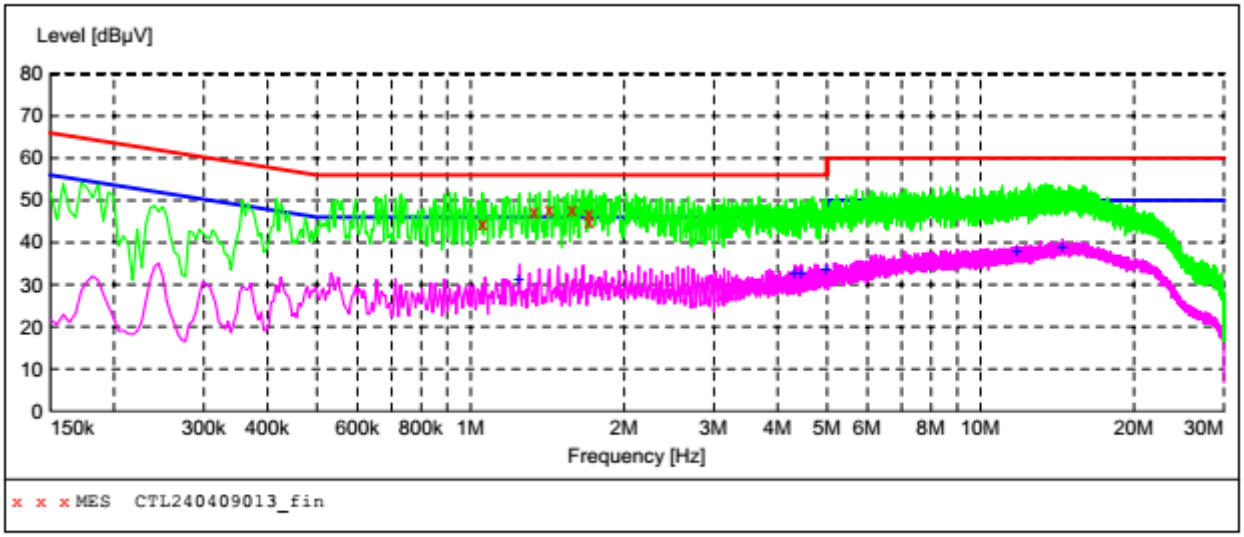
Remark: Level(dBuV)=Reading(dBuV) + Transd.(dB)

Margin=Limit(dBuV)- Level(dBuV)

Test Mode	WIFI	Line:	N
Adapter 1			

SCAN TABLE: "Voltage (9K-30M)FIN"

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL240409013_fin"

4/9/2024 9:43AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
1.054500	44.30	10.1	56	11.7	QP	N	GND
1.333500	47.40	10.1	56	8.6	QP	N	GND
1.428000	47.70	10.1	56	8.3	QP	N	GND
1.581000	48.00	10.1	56	8.0	QP	N	GND
1.702500	46.70	10.1	56	9.3	QP	N	GND
1.711500	45.00	10.1	56	11.0	QP	N	GND

MEASUREMENT RESULT: "CTL240409013_fin2"

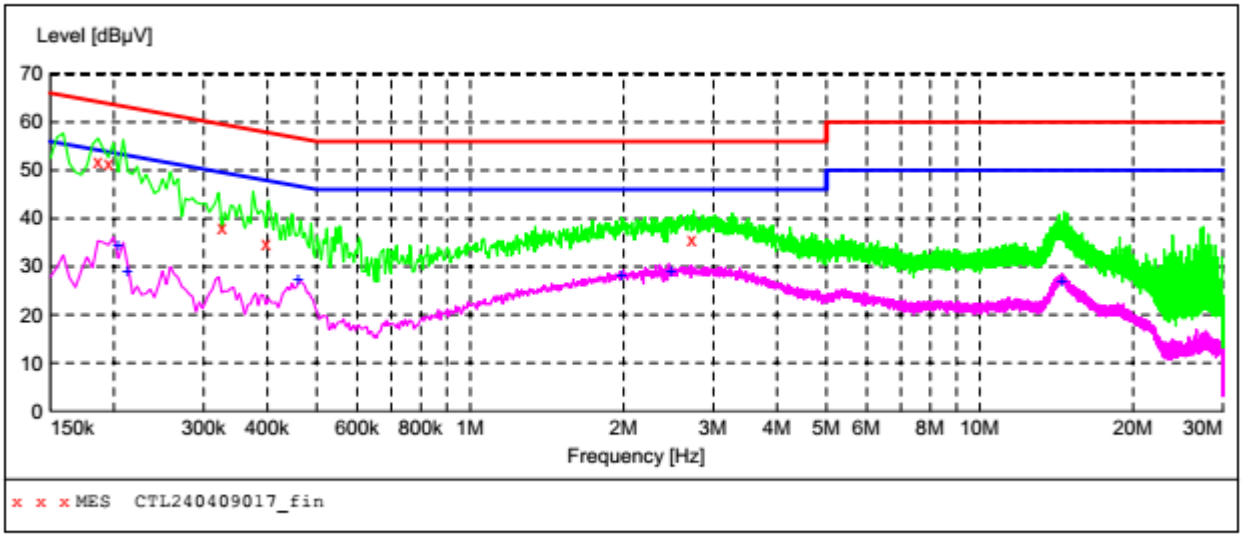
4/9/2024 9:43AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
1.243500	31.40	10.1	46	14.6	AV	N	GND
4.326000	32.60	10.1	46	13.4	AV	N	GND
4.452000	32.70	10.1	46	13.3	AV	N	GND
4.978500	33.40	10.1	46	12.6	AV	N	GND
11.809500	37.70	10.9	50	12.3	AV	N	GND
14.464500	39.00	11.1	50	11.0	AV	N	GND

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

Test Mode	WIFI	Line:	L
Adapter 2			

SCAN TABLE: "Voltage (9K-30M)FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL240409017_fin"

4/9/2024 9:55AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.186000	51.80	10.0	64	12.4	QP	L1	GND
0.195000	51.20	10.0	64	12.6	QP	L1	GND
0.325500	38.30	10.0	60	21.3	QP	L1	GND
0.397500	34.60	10.0	58	23.3	QP	L1	GND
2.719500	35.50	10.1	56	20.5	QP	L1	GND

MEASUREMENT RESULT: "CTL240409017_fin2"

4/9/2024 9:55AM

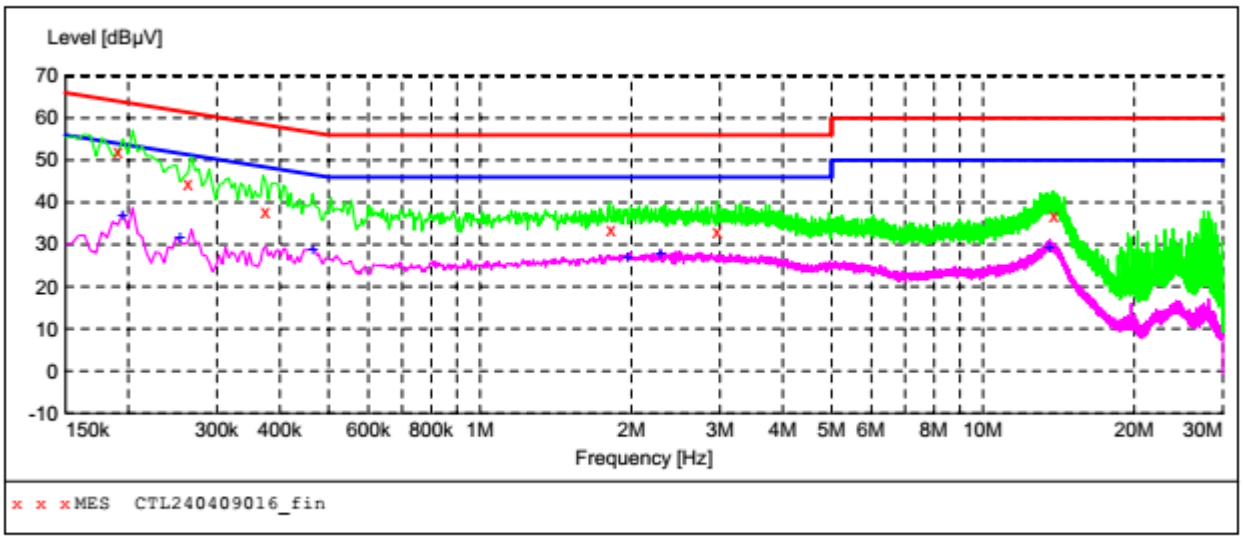
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.204000	34.20	10.0	53	19.2	AV	L1	GND
0.213000	28.80	10.0	53	24.3	AV	L1	GND
0.460500	27.10	10.0	47	19.6	AV	L1	GND
1.986000	28.10	10.1	46	17.9	AV	L1	GND
2.485500	29.00	10.1	46	17.0	AV	L1	GND
14.532000	26.70	11.1	50	23.3	AV	L1	GND

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

Test Mode	WIFI	Line:	N
Adapter 2			

SCAN TABLE: "Voltage (9K-30M)FIN"

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL240409016_fin"

4/9/2024 9:53AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.190500	52.20	10.0	64	11.8	QP	N	GND
0.262500	44.40	10.0	61	17.0	QP	N	GND
0.375000	37.80	10.0	58	20.6	QP	N	GND
1.824000	33.70	10.1	56	22.3	QP	N	GND
2.962500	33.10	10.1	56	22.9	QP	N	GND
13.843500	36.80	11.1	60	23.2	QP	N	GND

MEASUREMENT RESULT: "CTL240409016_fin2"

4/9/2024 9:53AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.195000	37.00	10.0	54	16.8	AV	N	GND
0.253500	31.60	10.0	52	20.0	AV	N	GND
0.465000	28.60	10.0	47	18.0	AV	N	GND
1.968000	27.00	10.1	46	19.0	AV	N	GND
2.287500	27.70	10.1	46	18.3	AV	N	GND
13.564500	29.10	11.0	50	20.9	AV	N	GND

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.

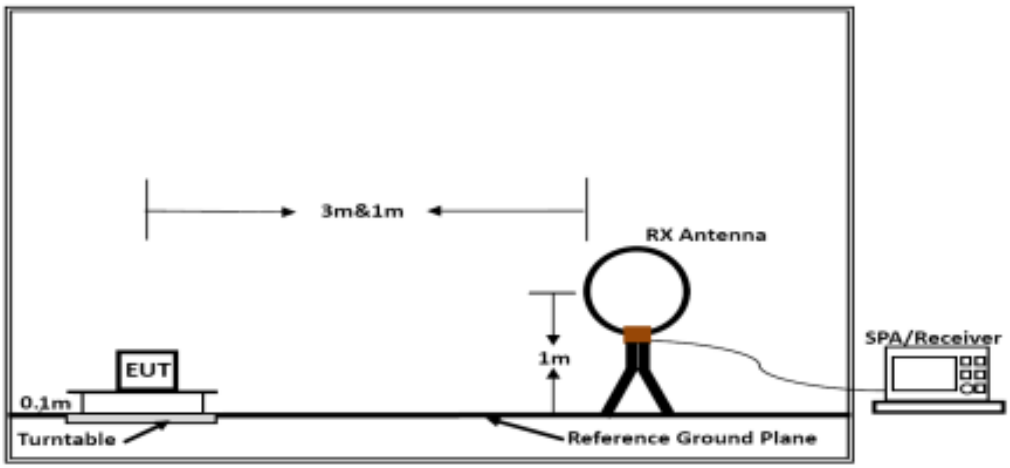
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Radiated emission limits

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(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

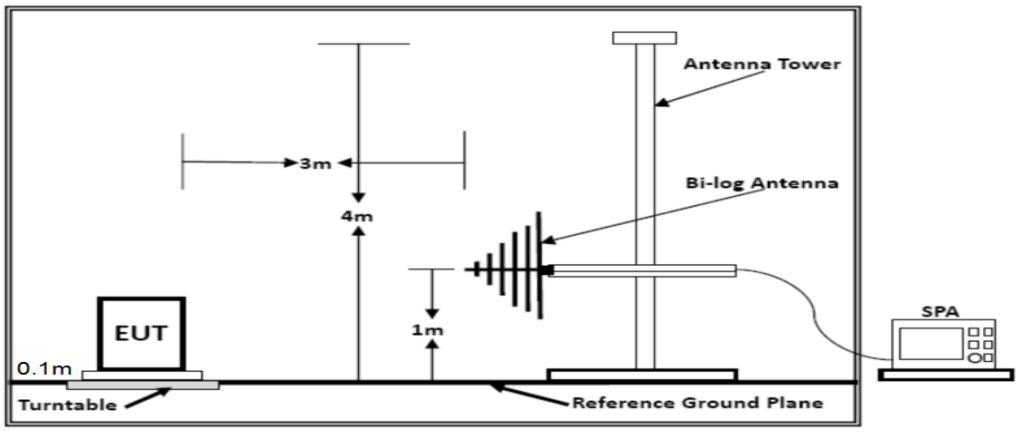
TEST CONFIGURATION

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



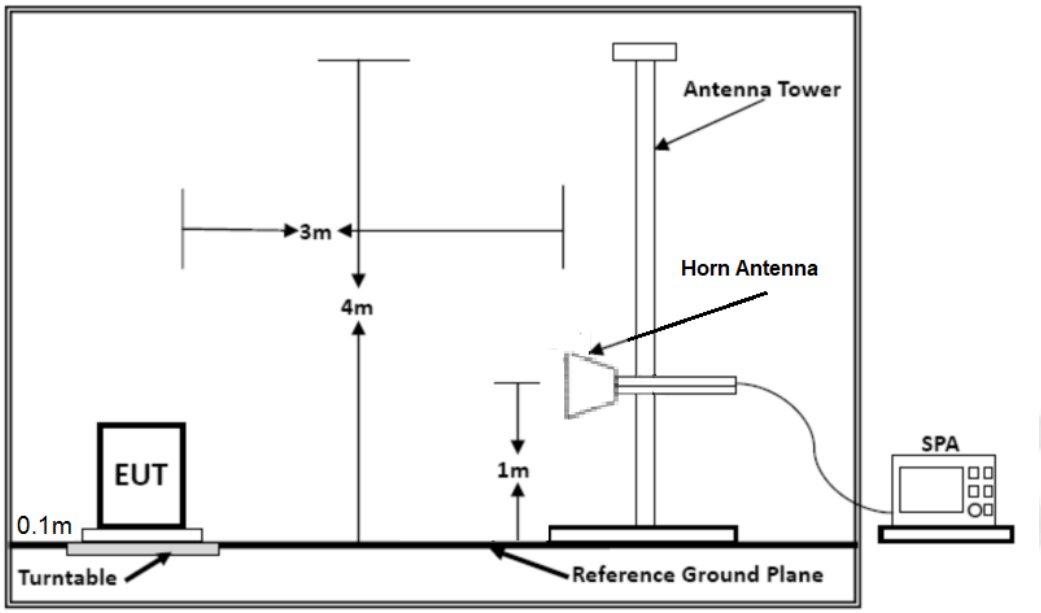
Below 30MHz

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



Below 1GHz

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



Above 1GHz

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 Anternna	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 record in report.

For 30MHz-1GHz

Test mode:	WIFI	Polarization:	Horizontal
Adapter 1			

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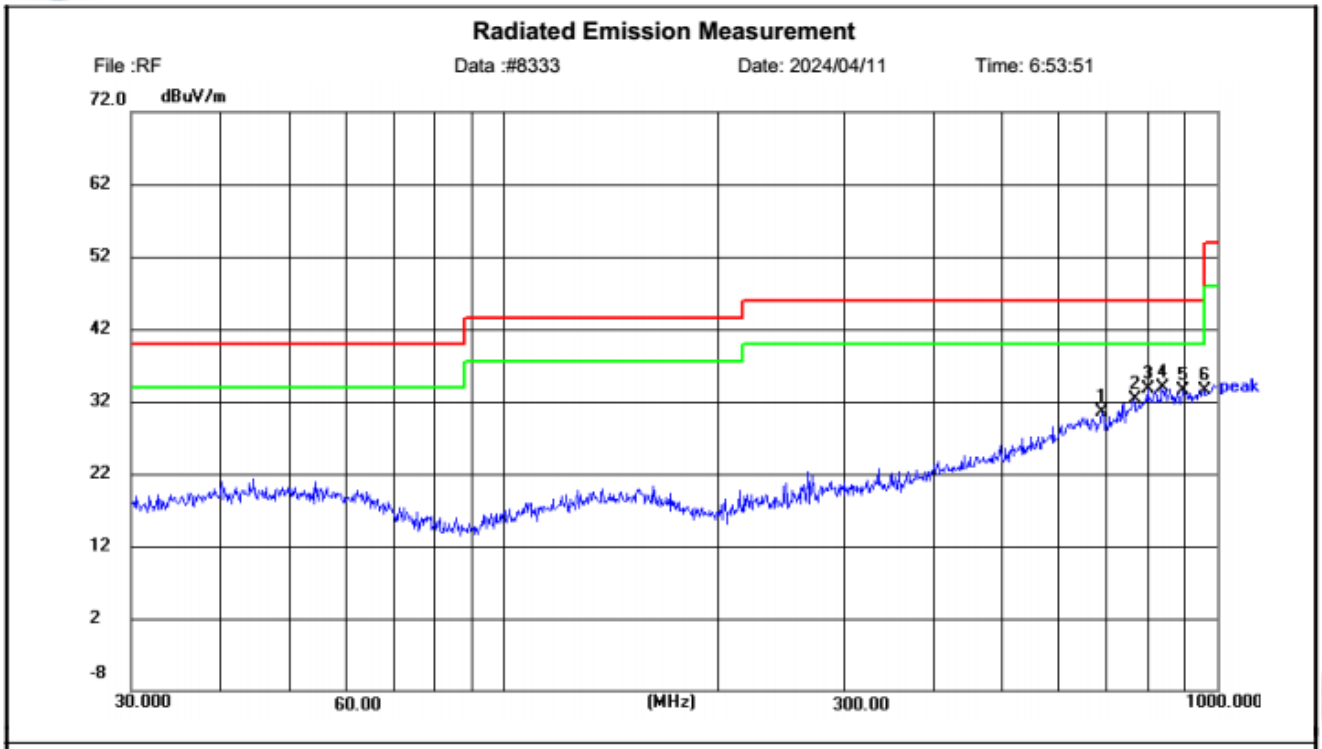

Site LAB Chamber 2
Limit: FCC Part15 RE-Class C_30-1000MHz
EUT: /
M/N: Aiper Scuba S1
Mode: WIFI2.4G 2412MHz
Note: Shenzhen Aiper Intelligent Co.,Ltd

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	691.6834	7.75	22.74	30.49	46.00	15.51	peak	100	17	P	
2	763.7103	7.48	24.84	32.32	46.00	13.68	peak	100	40	P	
3	799.6804	8.08	25.63	33.71	46.00	12.29	peak	100	304	P	
4	839.1818	7.79	26.16	33.95	46.00	12.05	peak	100	78	P	
5	896.2105	7.04	26.46	33.50	46.00	12.50	peak	100	87	P	
6	960.8979	6.33	27.23	33.56	54.00	20.44	peak	100	164	P	

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

Test mode:	WIFI	Polarization:	Vertical
Adapter 1			

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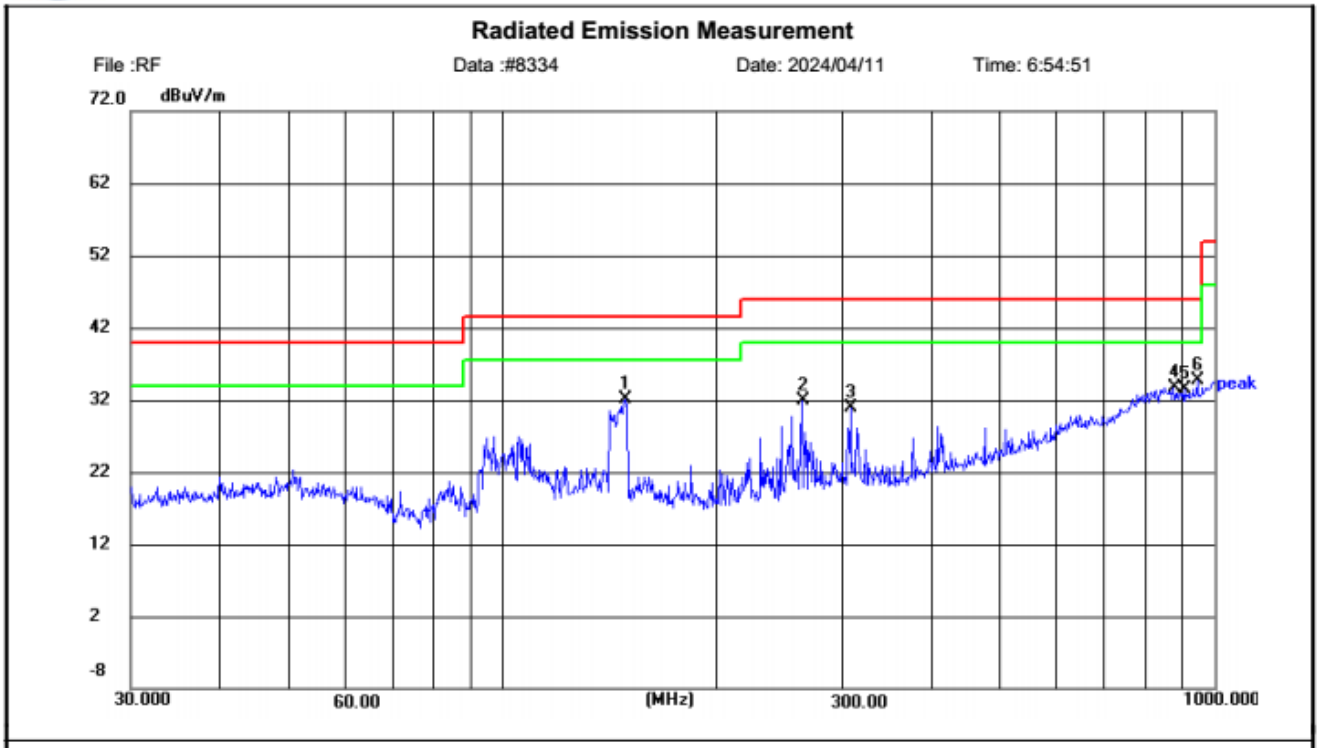

Site LAB Chamber 2
Limit: FCC Part15 RE-Class C_30-1000MHz
EUT: /
M/N: Aiper Scuba S1
Mode: WIFI2.4G 2412MHz
Note: Shenzhen Aiper Intelligent Co.,Ltd

Polarization: *Vertical*
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	148.7015	18.35	13.70	32.05	43.50	11.45	peak	100	312	P	
2	263.2415	18.84	13.12	31.96	46.00	14.04	peak	100	111	P	
3	308.5067	16.08	14.73	30.81	46.00	15.19	peak	100	11	P	
4	876.0146	7.85	25.82	33.67	46.00	12.33	peak	100	33	P	
5	906.8799	6.83	26.63	33.46	46.00	12.54	peak	100	96	P	
6	947.9296	7.66	27.11	34.77	46.00	11.23	peak	100	104	P	

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

Test mode:	WIFI	Polarization:	Horizontal
Adapter 2			

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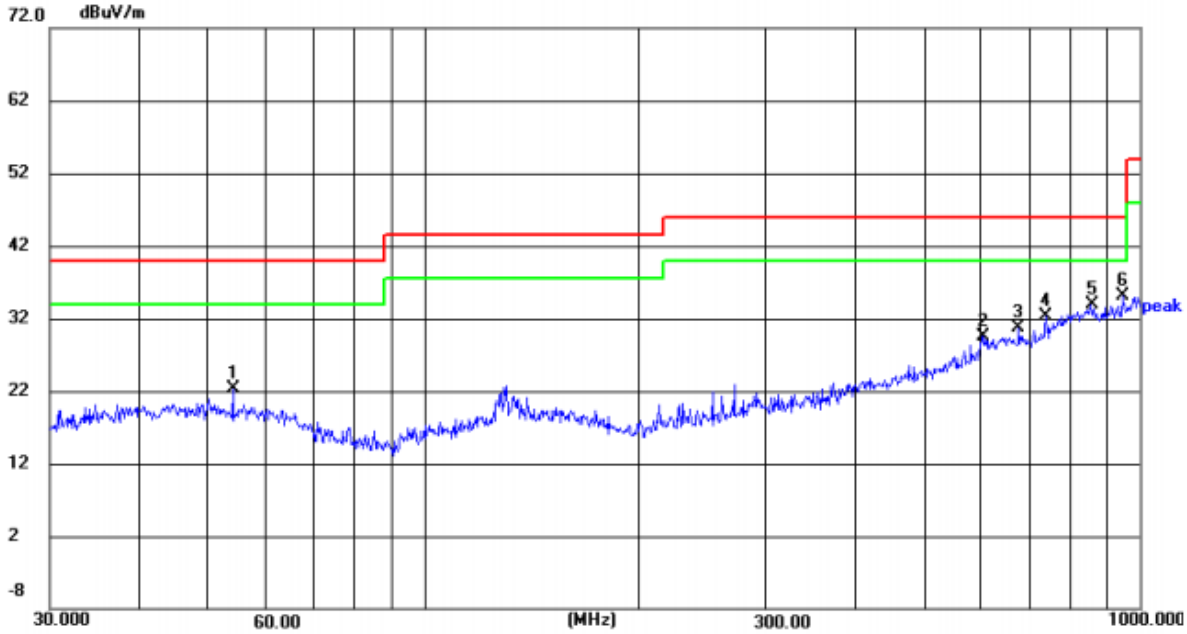
Radiated Emission Measurement

File :RF Data :#8339 Date: 2024/04/11 Time: 7:02:16



Site LAB Chamber 2
Limit: FCC Part15 RE-Class C_30-1000MHz
EUT: /
M/N: Aiper Scuba S1
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	54.2372	8.01	14.25	22.26	40.00	17.74	peak	100	102	P	
2	603.2746	7.67	21.86	29.53	46.00	16.47	peak	100	171	P	
3	679.9600	7.91	22.72	30.63	46.00	15.37	peak	100	179	P	
4	740.9583	8.19	24.05	32.24	46.00	13.76	peak	100	264	P	
5	856.2737	7.64	26.34	33.98	46.00	12.02	peak	100	249	P	
6	947.5142	8.04	27.11	35.15	46.00	10.85	peak	100	32	P	

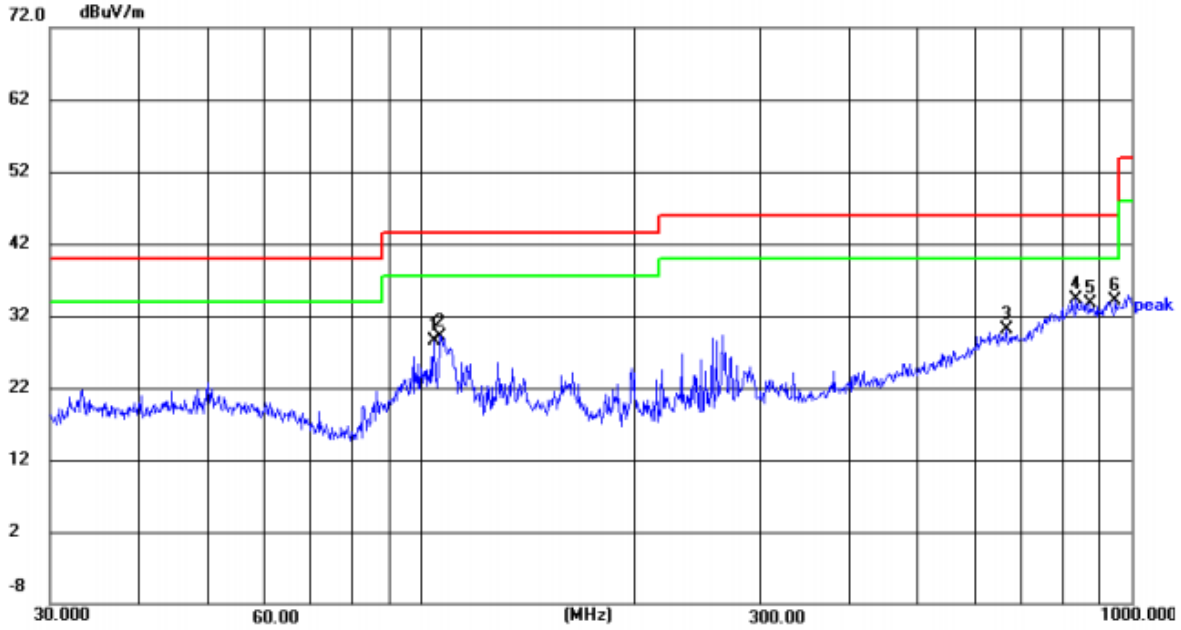
Remark: Level(dBuV/m)=Reading(dBuV)+Factor(dB/m)
Margin= Limit(dBuV/m)- Level(dBuV/m)

Test mode:	WIFI	Polarization:	Vertical
Adapter 2			

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

Radiated Emission Measurement

File :RF Data :#8340 Date: 2024/04/11 Time: 7:03:16



Site LAB Chamber 2
Limit: FCC Part15 RE-Class C_30-1000MHz
EUT: /
M/N: Aiper Scuba S1
Mode: WIFI2.4G 2412MHz
Note: Shenzhen Aiper Intelligent Co.,Ltd

Polarization: *Vertical*
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	104.3072	16.71	11.74	28.45	43.50	15.05	peak	100	19	P	
2	106.5717	17.16	12.04	29.20	43.50	14.30	peak	100	42	P	
3	667.2643	7.53	22.60	30.13	46.00	15.87	peak	100	204	P	
4	836.2443	8.25	25.98	34.23	46.00	11.77	peak	100	34	P	
5	874.0968	7.88	25.75	33.63	46.00	12.37	peak	100	189	P	
6	951.2594	6.93	27.11	34.04	46.00	11.96	peak	100	119	P	

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

For 1GHz to 25GHz

802.11b Mode (above 1GHz)

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

Frequency(MHz):			2412		Polarity:			HORIZONTAL	
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4824.00	49.27	PK	74	24.73	44.72	33.52	6.92	35.89	4.55
4824.00	--	AV	54	--	--	--	--	--	--
5725.00	44.55	PK	74	29.45	37.35	34.38	7.10	34.28	7.20
5725.00	--	AV	54	--	--	--	--	--	--
7436.00	47.21	PK	74	26.79	35.94	37.1	9.19	35.02	11.27
7436.00	--	AV	54	--	--	--	--	--	--

Frequency(MHz):			2412		Polarity:			VERTICAL	
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4824.00	49.26	PK	74	24.74	44.71	33.52	6.92	35.89	4.55
4824.00	--	AV	54	--	--	--	--	--	--
5823.00	45.74	PK	74	28.26	38.54	34.38	7.10	34.28	7.20
5823.00	--	AV	54	--	--	--	--	--	--
7436.00	47.52	PK	74	26.48	36.25	37.1	9.19	35.02	11.27
7436.00	--	AV	54	--	--	--	--	--	--

Frequency(MHz):			2437		Polarity:			HORIZONTAL	
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4874.00	52.07	PK	74	21.93	45.83	33.59	6.95	34.3	6.24
4874.00	--	AV	54	--	--	--	--	--	--
5741.00	45.76	PK	74	28.24	38.16	34.56	7.15	34.11	7.60
5741.00	--	AV	54	--	--	--	--	--	--
7311.00	46.11	PK	74	27.89	34.45	37.44	9.22	35	11.66
7311.00	--	AV	54	--	--	--	--	--	--

Frequency(MHz):			2437		Polarity:			VERTICAL	
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4874.00	48.28	PK	74	25.72	41.94	33.59	6.95	34.2	6.34
4874.00	--	AV	54	--	--	--	--	--	--
5675.00	44.69	PK	74	29.31	37.79	34.07	7.05	34.22	6.90
5675.00	--	AV	54	--	--	--	--	--	--
7311.00	46.57	PK	74	27.43	34.91	37.44	9.22	35	11.66
7311.00	--	AV	54	--	--	--	--	--	--

Frequency(MHz):			2462		Polarity:			HORIZONTAL	
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4924.00	49.55	PK	74	24.45	53.55	33.71	6.98	35.91	4.78
4924.00	--	AV	54	--	--	--	--	--	--
5752.00	46.21	PK	74	27.79	41.24	34.34	7.09	34.27	7.17
5752.00	--	AV	54	--	--	--	--	--	--
7386.00	47.14	PK	74	26.86	37.4	37.61	9.25	34.98	11.88
7386.00	--	AV	54	--	--	--	--	--	--

Frequency(MHz):			2462		Polarity:			VERTICAL	
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4924.00	51.05	PK	74	22.95	46.27	33.71	6.98	35.91	4.78
4924.00	--	AV	54	--	--	--	--	--	--
5947.00	45.11	PK	74	28.89	37.94	34.34	7.09	34.27	7.17
5947.00	--	AV	54	--	--	--	--	--	--
7386.00	47.27	PK	74	26.73	35.39	37.61	9.25	34.98	11.88
7386.00	--	AV	54	--	--	--	--	--	--

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
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, so it does not record in report.

Results of Band Edges Test (Radiated)

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

Frequency(MHz):			2412		Polarity:			HORIZONTAL
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Correction Factor (dB/m)
2412.00	109.21	PK	--	--	75.82	28.78	4.61	33.39
2412.00	97.55	AV	--	--	64.16	28.78	4.61	33.39
2356.00	45.14	PK	74	28.86	12.06	28.52	4.56	33.08
2356.00	--	AV	54	--	--	--	--	--
2390.00	48.24	PK	74	25.76	14.92	28.72	4.6	33.32
2390.00	--	AV	54	--	--	--	--	--
2400.00	55.47	PK	74	18.53	22.08	28.78	4.61	33.39
2400.00	48.39	AV	54	5.61	15	28.78	4.61	33.39

Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Correction Factor (dB/m)
2412.00	110.01	PK	--	--	76.62	28.78	4.61	33.39
2412.00	102.55	AV	--	--	69.16	28.78	4.61	33.39
2357.00	46.24	PK	74	27.76	13.16	28.52	4.56	33.08
2357.00	--	AV	54	--	--	--	--	--
2390.00	51.68	PK	74	22.32	18.36	28.72	4.60	33.32
2390.00	--	AV	54	--	--	--	--	--
2400.00	56.22	PK	74	17.78	22.83	28.78	4.61	33.39
2400.00	49.77	AV	54	4.23	16.38	28.78	4.61	33.39

Frequency(MHz):			2462		Polarity:			HORIZONTAL
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Correction Factor (dB/m)
2462.00	106.52	PK	--	--	72.9	28.92	4.7	33.62
2462.00	99.47	AV	--	--	65.85	28.92	4.7	33.62
2483.50	55.88	PK	74	18.12	22.25	28.93	4.7	33.63
2483.50	48.56	AV	54	5.44	14.93	28.93	4.7	33.63
2495.00	45.44	PK	74	28.56	11.8	28.94	4.71	33.64
2495.00	--	AV	54	--	--	--	--	--
2500.00	44.89	PK	74	29.11	11.21	28.96	4.72	33.68
2500.00	--	AV	54	--	--	--	--	--

Frequency(MHz):			2462		Polarity:			VERTICAL
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Correction Factor (dB/m)
2462.00	111.21	PK	--	--	77.59	28.92	4.7	33.62
2462.00	103.47	AV	--	--	69.85	28.92	4.7	33.62
2483.50	56.12	PK	74	17.88	22.49	28.93	4.7	33.63
2483.50	49.59	AV	54	4.41	15.96	28.93	4.7	33.63
2495.00	47.54	PK	74	26.46	13.9	28.94	4.71	33.64
2495.00	--	AV	54	--	--	--	--	--
2500.00	44.28	PK	74	29.72	10.6	28.96	4.72	33.68
2500.00	--	AV	54	--	--	--	--	--

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.
6. For fundamental frequency, RBW 3MHz VBW 3MHz Peak detector is for PK Value; RMS detector is for AV value.

3.3. Maximum Conducted Output Power

Limit

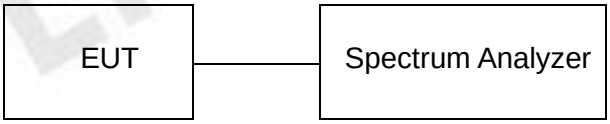
The Maximum Peak Output Power Measurement is 30dBm.

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 m 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 ≥ 3 X RBW.
d) Number of points in sweep ≥ [2 x span / RBW]. (This gives bin-to-bin spacing _ 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 ≥ 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

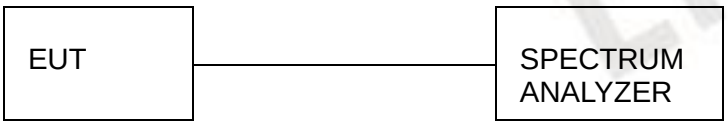
Limit

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 ≥ 3× RBW.
4. Set the span to 1.5 times the DTS channel bandwidth.
5. Detector = Average.
6. Sweep points = 40001
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 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

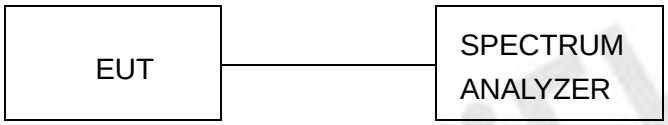
Limit

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 con-ducted or a radiated measurement, pro-vided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter com-plies 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 WIFI2.4G.

3.7. Antenna Requirement

Standard requirement

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:

Antenna Connector Construction

The device used an Integrated antenna 50Ω PCB Antenna, the maximum gain of antenna is 4.16dBi. There is no consideration of replacement the antenna. Please see EUT photo for details.

Results: Compliance.

4. Test Setup Photos of the EUT

Reference to the test report No. CTL2404037071-WF01.

5. Photos of the EUT

Reference to the test report No. CTL2404037071-WF01.

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