

TEST REPORT

Applicant: Siren Marine, Inc.

EUT Description: Data Communication Module

Model: Siren 3

Brand: Siren Marine and Connected Boat

Standards: FCC 47 CFR Part 15 Subpart B

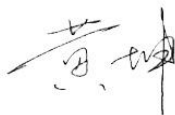
Date of Receipt: 2024/11/12

Date of Test: 2024/11/12 to 2024/12/12

Date of Issue: 2024/12/12

TOWE. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

the results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of the model are manufactured with identical electrical and mechanical components. All sample tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise. without written approval of TOWE, the test report shall not be reproduced except in full.



Huang Kun
Approved By:



Chen Chengfu
Reviewed By:

Revision History

Rev.	Issue Date	Description	Revised by
01	2024/12/12	Original	Chen Chengfu

Summary of Test Results

Test Items	Test Standard	Result
Radiated Emissions	§15.109	PASS
AC Conducted Emissions	§15.107	N/A
Test Method: ANSI C63.4-2014		
Remark:		
1. Pass is EUT meets standard requirements.		
2. The EUT is DC power supply, "N/A" denotes "not applicable".		

Table of Contents

1	General Description	5
1.1	Lab Information.....	5
1.1.1	Testing Location	5
1.1.2	Test Facility / Accreditations	5
1.2	Client Information	5
1.2.1	Applicant.....	5
1.2.2	Manufacturer.....	5
1.3	Product Information.....	6
2	Test Configuration During Test	7
2.1	Support Unit used in test	7
2.2	Accessory.....	7
2.3	Test Environment.....	7
2.4	Modifications.....	7
2.5	EUT Test Mode.....	7
3	Equipment and Measurement Uncertainty.....	8
3.1	Test Equipment List.....	8
3.2	Measurement Uncertainty	8
4	Test Results.....	9
4.1	Radiated Emissions.....	9
5	Test Setup Photos.....	15

1 General Description

1.1 Lab Information

1.1.1 Testing Location

These measurements tests were conducted at the Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. facility located at F401 and F101, Building E, Hongwei Industrial Zone, Liuxian 3rd Road, Bao'an District, Shenzhen, China. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014

Tel.: +86-755-27212361

Contact Email: info@towewireless.com

1.1.2 Test Facility / Accreditations

A2LA (Certificate Number: 7088.01)

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

FCC Designation No.: CN1353

Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. has been recognized as an accredited testing laboratory. Designation Number: CN1353.

ISED CAB identifier: CN0152

Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0152

Company Number: 31000

1.2 Client Information

1.2.1 Applicant

Applicant:	Siren Marine, Inc.
Address:	221 3rd St, Suite 300, Newport, RI 02840, United States

1.2.2 Manufacturer

Manufacturer:	Siren Marine, Inc.
Address:	221 3rd St, Suite 300, Newport, RI 02840, United States

1.3 Product Information

EUT Description:	Data Communication Module		
Model:	Siren 3		
Brand:	Siren Marine and Connected Boat		
Hardware Version:	V1.0		
Software Version:	S3_App-0.1.19		
IMEI:	862063070013656		
Frequency Bands:	Frequency Bands	Tx Frequency (MHz)	Rx Frequency (MHz)
	Cat M1 Band 2	1850 ~ 1910 MHz	1930 ~ 1990 MHz
	Cat M1 Band 4	1710 ~ 1755 MHz	2110 ~ 2155 MHz
	Cat M1 Band 5	824 ~ 849 MHz	869 ~ 894 MHz
	Cat M1 Band 12	699 ~ 716 MHz	729 ~ 746 MHz
	Cat M1 Band 13	777 ~ 787 MHz	746 ~ 756 MHz
	Cat M1 Band 25	1850 ~ 1915 MHz	1930 ~ 1995 MHz
	Cat M1 Band 26 (814 ~ 824 MHz)	814 ~ 824MHz	859 ~ 869 MHz
	Cat M1 Band 26 (824 ~ 849 MHz)	824 ~ 849 MHz	869 ~ 894 MHz
	Cat M1 Band 66	1710 ~ 1780 MHz	2110 ~ 2200 MHz
	Cat M1 Band 85	698 ~ 716 MHz	728 ~ 746 MHz
	NTN Band 23	2000 ~ 2020 MHz	2180 ~ 2200 MHz
	NTN Band 255	1626.5 ~ 1660.5 MHz	1525 ~1559 MHz
	2.4G WiFi	2412~2462	2412~2462
	Bluetooth (BLE)	2402~2480	2402~2480
	Sub-G	906 ~ 924	906 ~ 924
Remark: The above EUT's information was declared by applicant, please refer to the specifications or user's manual for more detailed description.			

2 Test Configuration During Test

2.1 Support Unit used in test

Description	Manufacturer	Model	Serial Number
Laptop	Lenovo	Thinkbook 14 G4+IAP	YX05AZ13
Wideband Radio Communication Tester	R&S	CMW500	171955
DC POWER	WANPTEK	WPS305H	/

2.2 Accessory

N/A

2.3 Test Environment

Temperature:	Normal: 22°C ~ 27°C
Relative Humidity	45 ~ 55 % RH Ambient
Voltage:	DC 12V
Remark: The testing environment is within the scope of the EUT user manual and meets the requirements of the standard testing environment.	

2.4 Modifications

No modifications were made during testing.

2.5 EUT Test Mode

Test Items	Test mode
Radiated Emissions	Mode 1: Cat M1 Band 5 Idle + CAN link + DC Power (Worst case) Mode 2: Cat M1 Band 12 Idle + CAN link + DC Power Mode 3: Cat M1 Band 13 Idle + CAN link + DC Power Mode 4: Cat M1 Band 26 Idle + CAN link + DC Power Mode 5: Cat M1 Band 85 Idle + CAN link + DC Power

Remark: Only data of worst mode was reported in test result.

3 Equipment and Measurement Uncertainty

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, whichever is less, and where applicable is traceable to recognized national standards.

3.1 Test Equipment List

Radiated Emission					
Description	Manufacturer	Model	S.N.	Last Due	Cal Due
Biconic Logarithmic Periodic Antennas	Schwarzbeck	VULB9163	1643	2023/06/25	2025/06/24
Double-Ridged Horn Antennas	Schwarzbeck	BBHA 9120D	2809	2023/06/25	2025/06/24
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	1290	2023/06/25	2025/06/24
Signal Analyzer	Keysight	N9020A	MY49100252	2024/03/25	2025/03/24
EXA Signal Analyzer, Multi-touch	Keysight	N9010B	MY63440541	2024/05/30	2025/05/29
EMI Tester Receiver	Rohde & Schwarz	ESR7	102719	2024/05/31	2025/05/30
Low Noise Amplifier	Tonscend	TAP9K3G40	AP23A8060273	2023/04/08	2025/04/07
Low Noise Amplifier	Tonscend	TAP01018050	AP22G806258	2023/04/08	2025/04/07
Low Noise Amplifier	Tonscend	TAP18040048	AP22G806247	2023/04/08	2025/04/07
Band Reject Filter Group	Townshend	JS0806-F	23A806F0652	N/A	N/A
Test Software	Tonscend	TS+	Version: 5.0.0	N/A	N/A

N/A: Not applicable, confirmed internally by the laboratory

3.2 Measurement Uncertainty

Parameter	U _{lab}
Radiated Emissions(30MHz~1000MHz)	4.66dB
Radiated Emissions(1GHz~18GHz)	5.42dB
Radiated Emissions(18GHz~40GHz)	5.46dB

Uncertainty figures are valid to a confidence level of 95%

4 Test Results

4.1 Radiated Emissions

Limits

Frequency	Field strength ($\mu\text{V/m}$)	Limit (dB $\mu\text{V/m}$)	Remark	Measurement distance (m)
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	74.0	Peak	3
		54.0	Average	

Test Procedure

ANSI C63.4:2014

Test Settings

- For radiated emissions measurements performed at frequencies less than or equal to 1GHz, the EUT shall be placed on a RF-transparent table or support at a nominal height of 80cm above the reference ground plane.
- For radiated emissions measurements performed at frequencies above 1GHz, the EUT shall be placed on a RF-transparent table or support at a nominal height of 80cm above the ground plane.
- Radiated measurements shall be made with the measurement antenna positioned in both horizontal and vertical polarization. The measurement antenna shall be varied from 1m to 4m in height above the reference ground in a search for the relative positioning that produces the maximum radiated signal level (i.e, field strength or received power), when orienting the measurement antenna in vertical polarization, the minimum height of the lowest element of the antenna shall clear the site reference ground plane by at least 25cm.
- For each suspected emission, the EUT was ranged to its worst case and then tune the antenna tower(from 1~4m) and turntable(from 0~360°) to find the maximum reading. Preamplifier and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
- Exploratory radiated emissions testing of handheld and/or body-worn devices shall include rotation of the EUT through three orthogonal axes (X/Y/Z Plane) to determine the orientation(attitude) that maximizes the emissions.
- For measurements below 1GHz the resolution bandwidth is set to 100kHz for peak detection measurements or 120kHz for Quasi-peak detection measurements in the 30~1000MHz range.
- If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, peak values of EUT will be reported. Otherwise, the emission will be repeated by using the quasi-peak method and reported for frequency range below 1GHz.
- For measurements above 1GHz the resolution bandwidth is set to 1MHz and the video resolution is set to 3MHz, the peak emission measurement will be measured by the peak detector, the average emission measurement will be measured by the average detector.
- The field strength is calculated by adding the Antenna Factor, Cable Factor. The basic equation with a sample calculation is as follows:

$$\text{Level} = \text{Reading}(\text{dB}\mu\text{V}) + \text{AF}(\text{dB/m}) + \text{Factor}(\text{dB}):$$

$$\text{AF} = \text{Antenna Factor}(\text{dB/m})$$

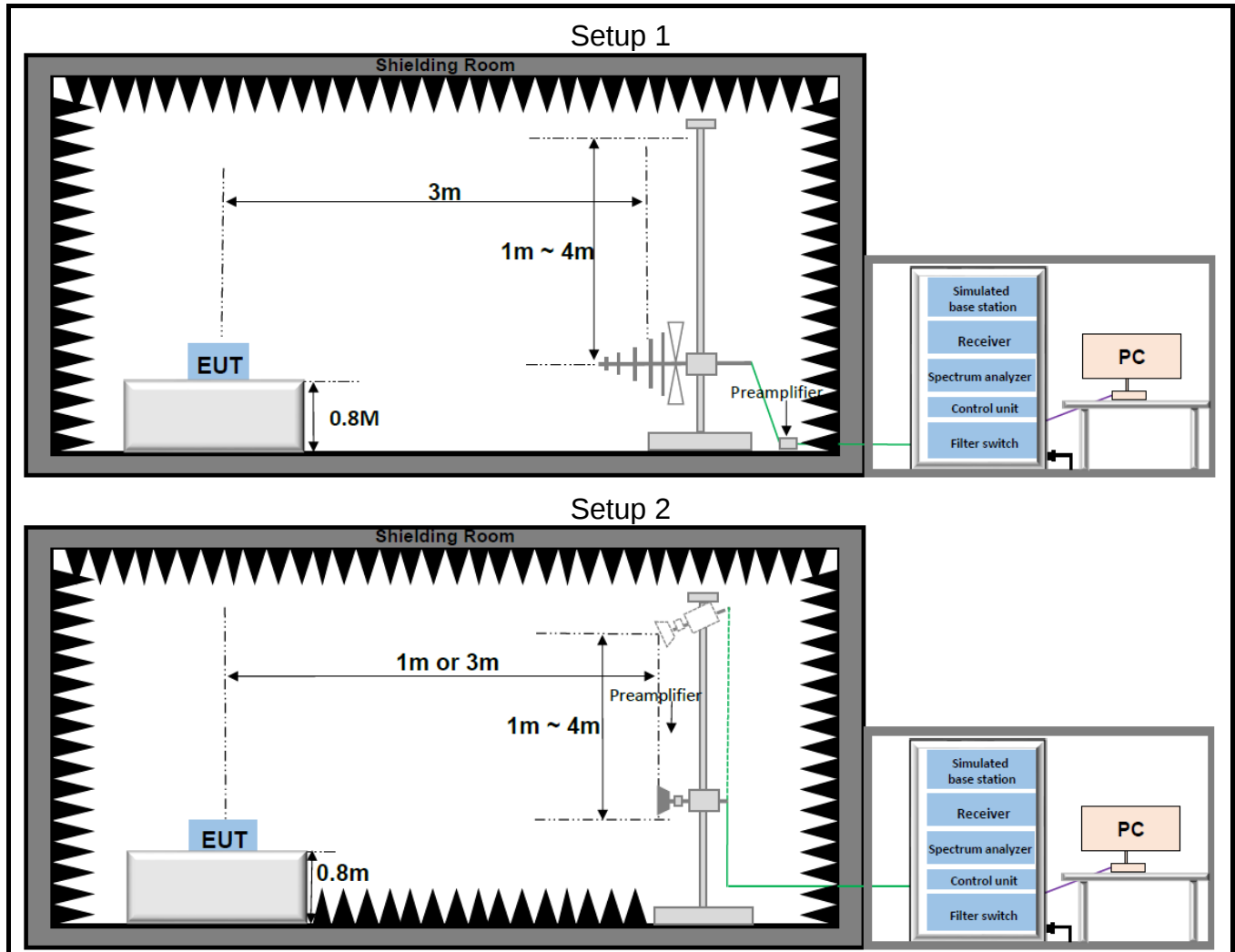
$$\text{Factor} = \text{Cable Factor}(\text{dB}) - \text{Preamplifier gain}(\text{dB})$$

$$\text{Margin} = \text{Limit}(\text{dB}\mu\text{V/m}) - \text{Level}(\text{dB}\mu\text{V/m})$$
- Measure and record the results in the test report.

Test notes

1. Radiated emissions were measured from 30MHz - 40GHz to ensure that the provisions of 15.33(b)(1) are satisfied with respect to the upper frequency scanning range. No Spurious emissions were detected above 18GHz.

Test Setup

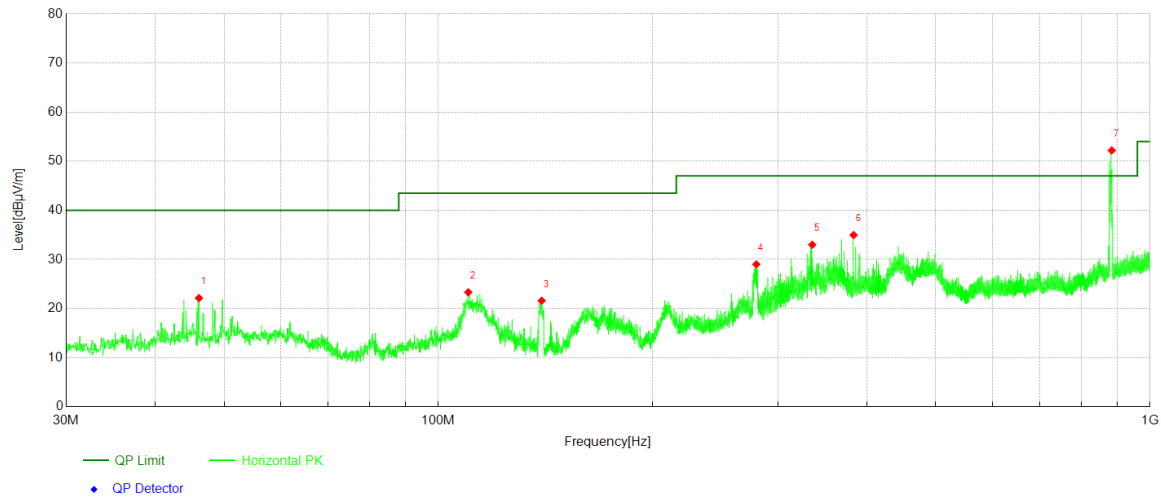


Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

Test Result:

Test Frequency	Below 1000MHz	Final Test mode:	Mode 1
Test Voltage:	DC 12V	Polarization:	Horizontal



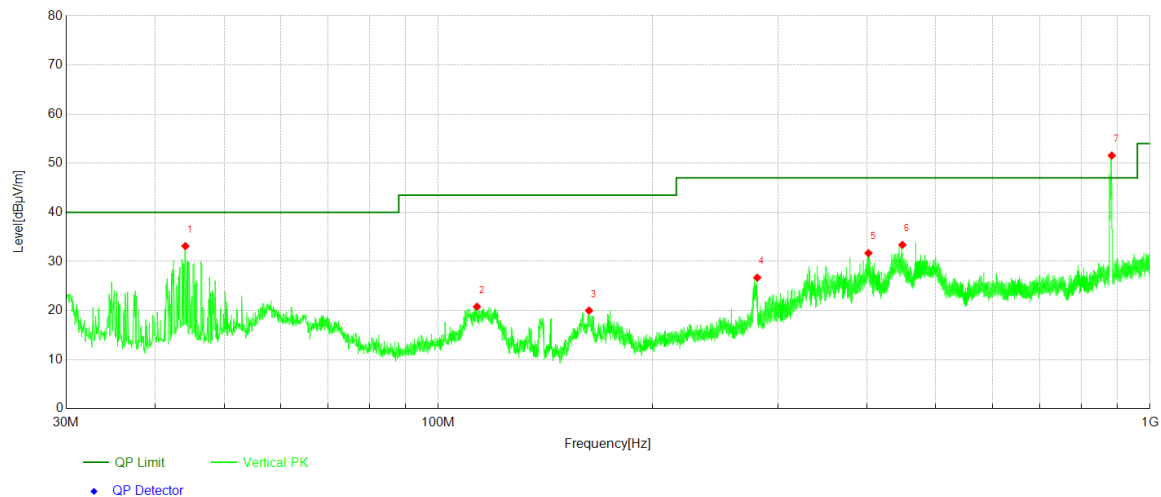
Data List

NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Verdict
1	46.10	45.71	-23.59	22.12	40.00	17.88	Horizontal	PASS
2	110.17	45.44	-22.13	23.31	43.50	20.19	Horizontal	PASS
3	139.71	47.73	-26.13	21.60	43.50	21.90	Horizontal	PASS
4	279.78	48.88	-19.89	28.99	47.00	18.01	Horizontal	PASS
5	335.26	50.98	-17.99	32.99	47.00	14.01	Horizontal	PASS
6	383.27	50.33	-15.37	34.96	47.00	12.04	Horizontal	PASS
7	883.50	60.30	-8.10	52.20	-	-	Horizontal	NA

Note:

- Level = Reading(dBμV) + Factor(dB):
- Factor = Cable Factor(dB) + AF(dB/m) - Preamplifier gain(dB)
- AF = Antenna Factor(dB/m)
- Margin = Limit(dBμV/m) - Value(dBμV/m)
- This frequency which near “-” should be ignored because this is Fundamental(Downlink) frequency.

Test Frequency	Below 1000MHz	Final Test mode:	Mode 1
Test Voltage:	DC 12V	Polarization:	Vertical



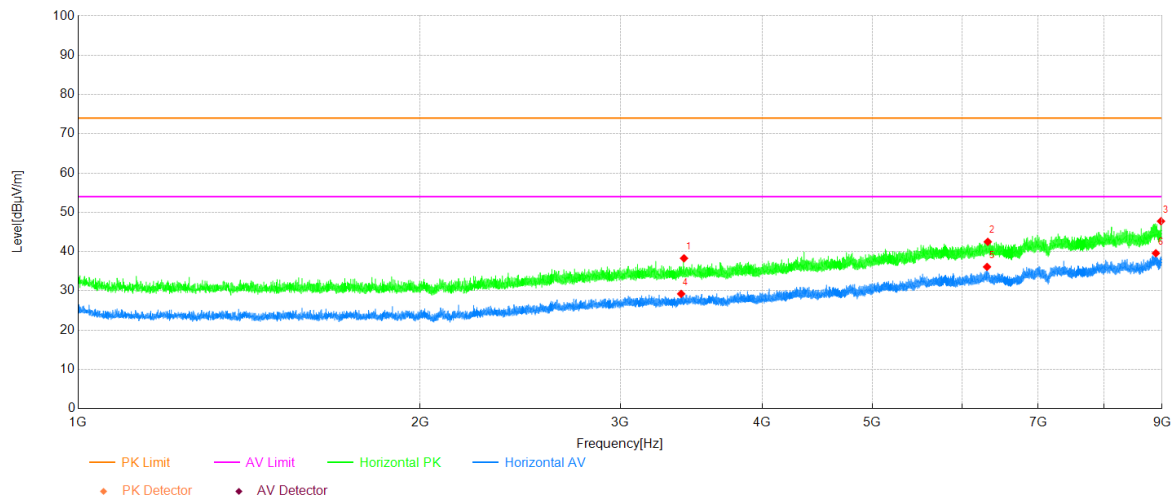
Data List

NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Verdict
1	44.11	55.82	-22.71	33.11	40.00	6.89	Vertical	PASS
2	113.32	44.06	-23.28	20.78	43.50	22.72	Vertical	PASS
3	162.84	45.04	-25.05	19.99	43.50	23.51	Vertical	PASS
4	280.60	47.24	-20.55	26.69	47.00	20.31	Vertical	PASS
5	402.14	44.34	-12.65	31.69	47.00	15.31	Vertical	PASS
6	448.80	42.37	-9.00	33.37	47.00	13.63	Vertical	PASS
7	883.60	59.92	-8.36	51.56	-	-	Vertical	NA

Note:

- Level = Reading(dBμV) + Factor(dB):
- Factor = Cable Factor(dB) + AF(dB/m) - Preamplifier gain(dB)
- AF = Antenna Factor(dB/m)
- Margin = Limit(dBμV/m) - Value(dBμV/m)
- This frequency which near “-” should be ignored because this is Fundamental(Downlink) frequency.

Test Frequency	Above 1000MHz	Final Test mode:	Mode 1
Test Voltage:	DC 12V	Polarization:	Horizontal

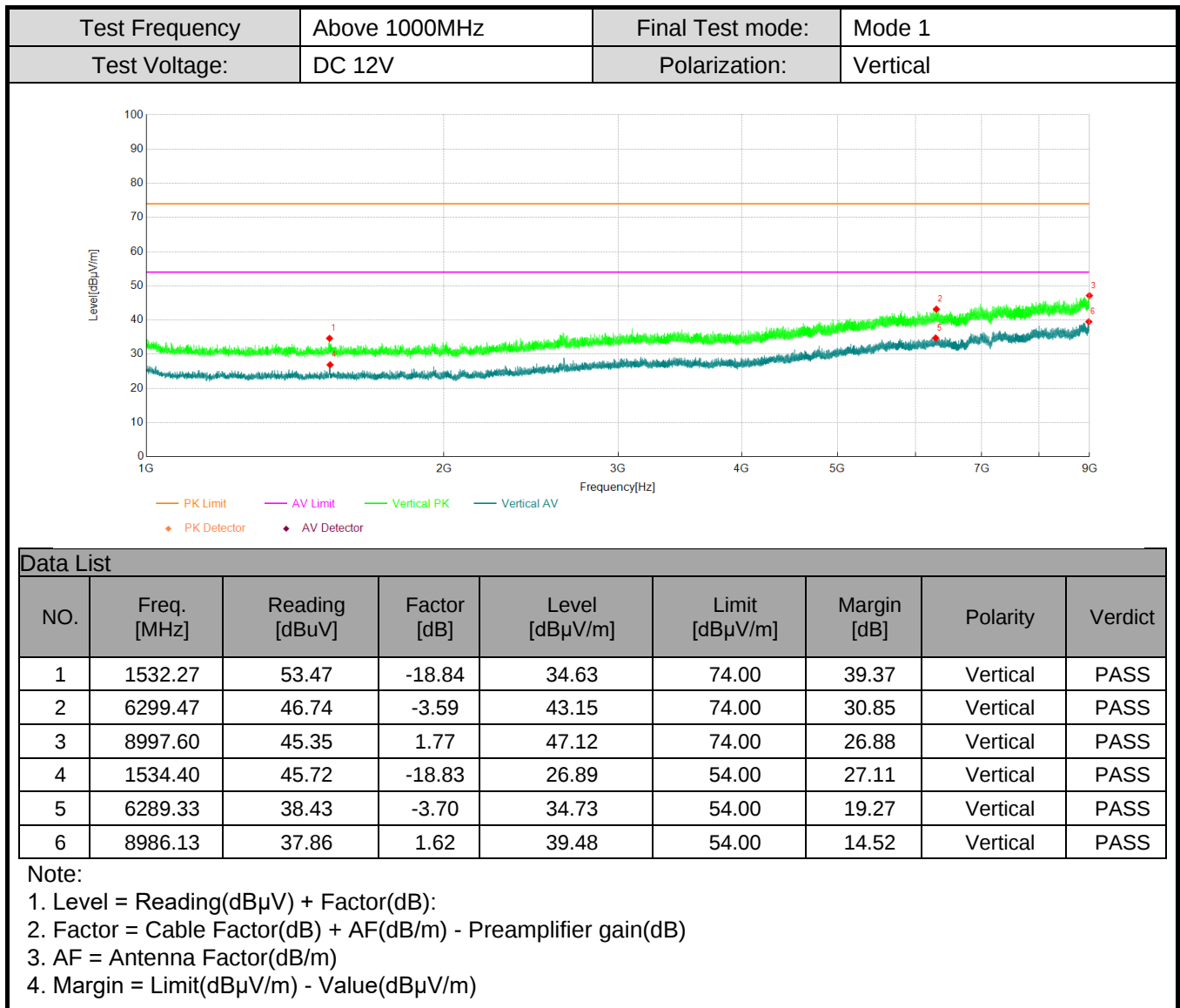


Data List

NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Verdict
1	3414.93	50.53	-12.23	38.30	74.00	35.70	Horizontal	PASS
2	6321.33	46.20	-3.70	42.50	74.00	31.50	Horizontal	PASS
3	8980.80	46.18	1.55	47.73	74.00	26.27	Horizontal	PASS
4	3395.20	41.57	-12.33	29.24	54.00	24.76	Horizontal	PASS
5	6312.27	39.77	-3.66	36.11	54.00	17.89	Horizontal	PASS
6	8888.00	37.42	2.16	39.58	54.00	14.42	Horizontal	PASS

Note:

1. Level = Reading(dBμV) + Factor(dB):
2. Factor = Cable Factor(dB) + AF(dB/m) - Preamplifier gain(dB)
3. AF = Antenna Factor(dB/m)
4. Margin = Limit(dBμV/m) - Value(dBμV/m)



5 Test Setup Photos

The detailed test data see: **Appendix A- 15B Setup Photos**

~The End~