

TEST REPORT

Applicant: Particle Industries, Inc.

EUT Description: Tachyon

Model: TACH4NA, TACH8NA

Brand: Particle

Standards: FCC 47 CFR Part 15 Subpart B

Date of Receipt: 2025/06/25

Date of Test: 2025/06/25 to 2025/09/29

Date of Issue: 2025/09/29

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.



Jim Huang
Approved By:



Mike Ou
Reviewed By:

Revision History

Rev.	Issue Date	Description	Revised by
01	2025/09/29	Original	Mike Ou

Summary of Test Results

Test Items	Test Standard	Result
AC Conducted Emissions	§15.107	PASS
Radiated Emissions	§15.109	PASS

Test Method: ANSI C63.4-2014
Remark: Pass is EUT meets standard requirements.

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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:	Particle Industries, Inc.
Address:	548 Market St, PMB 34833, San Francisco, CA 94104, USA

1.2.2 Manufacturer

Manufacturer:	Particle Industries, Inc.
Address:	548 Market St, PMB 34833, San Francisco, CA 94104, USA

1.3 Product Information

EUT Description:	Tachyon		
Model:	TACH4NA, TACH8NA		
Brand:	Particle		
Hardware Version:	V1.2		
Software Version:	1.0.160		
IMEI:	865136060030323		
Device Capabilities:	LTE/NR/LTE CA/ENDC + BT/BLE + Wi-Fi DTS/UNII a/b/g/n/ac/ax + GNSS		
Frequency bands within 30-960MHz	Band	TX Frequency	RX Frequency
	LTE Band 5	824 ~ 849 MHz	869 ~ 894 MHz
	LTE Band 12	699 ~ 716 MHz	729 ~ 746 MHz
	LTE Band 13	777 ~ 787 MHz	746 ~ 756 MHz
	LTE Band 14	788 ~ 798 MHz	758 ~ 768 MHz
	LTE Band 17	704 ~ 716 MHz	734 ~ 746 MHz
	LTE Band 26 (814 ~ 824 MHz)	814 ~ 824MHz	859 ~ 869 MHz
	LTE Band 26 (824 ~ 849 MHz)	824 ~ 849 MHz	869 ~ 894 MHz
	LTE Band 71	663 ~ 698 MHz	617 ~ 652 MHz
	NR Band n5	824 to 849 MHz	869 to 894 MHz
	NR Band n12	699 to 716 MHz	729 to 746 MHz
	NR Band n13	777 to 787 MHz	746 to 756 MHz
	NR Band n14	788 to 798 MHz	758 to 768 MHz
	NR Band n26 (814 to 824 MHz)	814 to 824MHz	859 to 869 MHz
	NR Band n26 (824 to 849 MHz)	824 to 849 MHz	869 to 894 MHz
	NR Band n71	663 to 698 MHz	617 to 652 MHz

Remark:

1. The above EUT's information was declared by applicant, please refer to the specifications or user's manual for more detailed description.
2. According to the customer's Letter of model difference, TACH4NA and TACH8NA are identical with each other, except for RAM and model number difference. Only the test data for Model No.(TACH4NA) was presented in the report.

2 Test Configuration During Test

2.1 Support Unit used in test

Description	Manufacturer	Model	Serial Number
Keyboard	Logitech	YR0091	/
Mouse	Logitech	M350s	/
Monitor	Dell	U2520D	CN-0Y5GX2-QDC00-26P-03IL-A09
Wideband Radio Communication Tester	R&S	CMW500	150645
Radio Communication Test Station	Anritsu	MT8000A	6262036781

2.2 Accessory

N/A

2.3 Test Environment

Temperature:	Normal: 15°C ~ 35°C
Humidity:	30-75 % RH Ambient
Test Voltage:	AC 120V/60Hz

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
AC Conducted Emissions	<p>Mode1: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen</p> <p>Mode2: EUT + LiPo + Type-C Cable + Mouse + Keyboard +Display Screen + Camera</p> <p>Mode3: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + M.2 SSD + MP4 Playing</p> <p>Mode4: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + LTE Band 5 Idle (worst case for CXX)</p> <p>Mode5: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + LTE Band 12 Idle</p> <p>Mode6: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + LTE Band 13 Idle</p> <p>Mode7: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + LTE Band 14 Idle</p> <p>Mode8: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + LTE Band 17 Idle</p> <p>Mode9: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + LTE Band 26 Idle</p> <p>Mode10: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + LTE Band 71 Idle</p> <p>Mode11: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + n5 Idle</p> <p>Mode12: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + n12 Idle</p> <p>Mode13: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + n13 Idle</p> <p>Mode14: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + n14 Idle</p> <p>Mode15: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + n26 Idle</p> <p>Mode16: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + n71 Idle</p>
Radiated Emissions	<p>Mode1: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen</p> <p>Mode2: EUT + LiPo + Type-C Cable + Mouse + Keyboard +Display Screen + Camera</p> <p>Mode3: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + M.2 SSD + MP4 Playing(worst case for JBP)</p> <p>Mode4: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + LTE Band 5 Idle</p> <p>Mode5: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + LTE Band 12 Idle</p> <p>Mode6: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + LTE Band 13 Idle</p> <p>Mode7: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + LTE Band 14 Idle</p> <p>Mode8: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + LTE Band 17 Idle</p> <p>Mode9: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + LTE Band 26 Idle</p> <p>Mode10: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + LTE Band 71 Idle</p> <p>Mode11: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + n5 Idle</p> <p>Mode12: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + n12 Idle</p> <p>Mode13: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + n13 Idle</p> <p>Mode14: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + n14 Idle</p>

	Mode15: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + n26 Idle Mode16: EUT + LiPo + Type-C Cable +Mouse + Keyboard + Display Screen + n71 Idle
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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	2026/06/24
Double-Ridged Horn Antennas	Schwarzbeck	BBHA 9120D	2809	2023/06/25	2026/06/24
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	1290	2023/06/25	2026/06/24
Signal Analyzer	Keysight	N9020A	MY49100252	2025/03/11	2026/03/10
EXA Signal Analyzer, Multi-touch	Keysight	N9010B	MY63440541	2025/05/29	2026/05/28
EMI Tester Receiver	Rohde & Schwarz	ESR7	102719	2025/05/29	2026/05/28
Low Noise Amplifier	Tonscend	TAP9K3G40	AP23A8060273	2025/03/11	2027/03/10
Low Noise Amplifier	Tonscend	TAP01018050	AP22G806258	2025/03/11	2027/03/10
Low Noise Amplifier	Tonscend	TAP18040048	AP22G806247	2025/03/11	2027/03/10
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					

Conducted Emission					
Description	Manufacturer	Model	S.N.	Last Due	Cal Due
EMI Tester Receive	Rohde & Schwarz	ESR3	103108	2025/05/29	2026/05/28
LISN	Rohde & Schwarz	ENV 216	102836	2025/01/04	2026/01/03
Test Software	Rohde & Schwarz	ELEKTRA	Version: 4.61	N/A	N/A
N/A: Not applicable, confirmed internally by the laboratory					

3.2 Measurement Uncertainty

Parameter	U _{lab}
Conducted Emissions(150kHz~30MHz)	2.43dB
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 AC Conducted Emissions

Limits

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

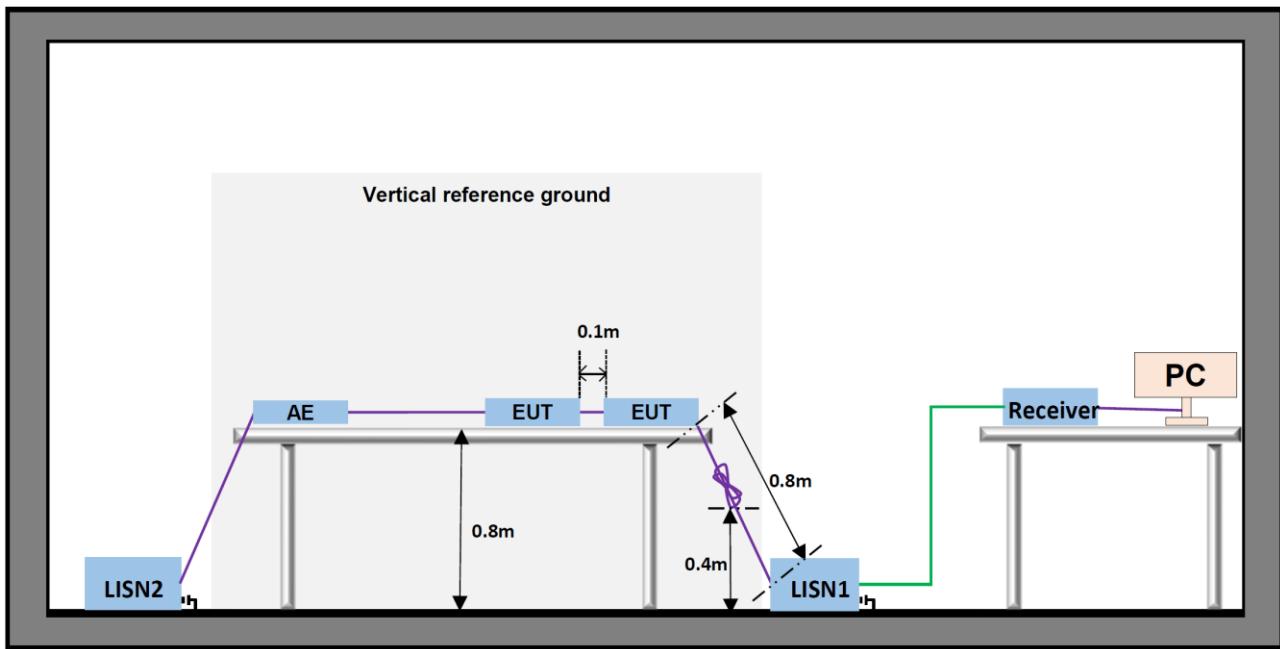
* Decreases with the logarithm of the frequency.

Test Procedure

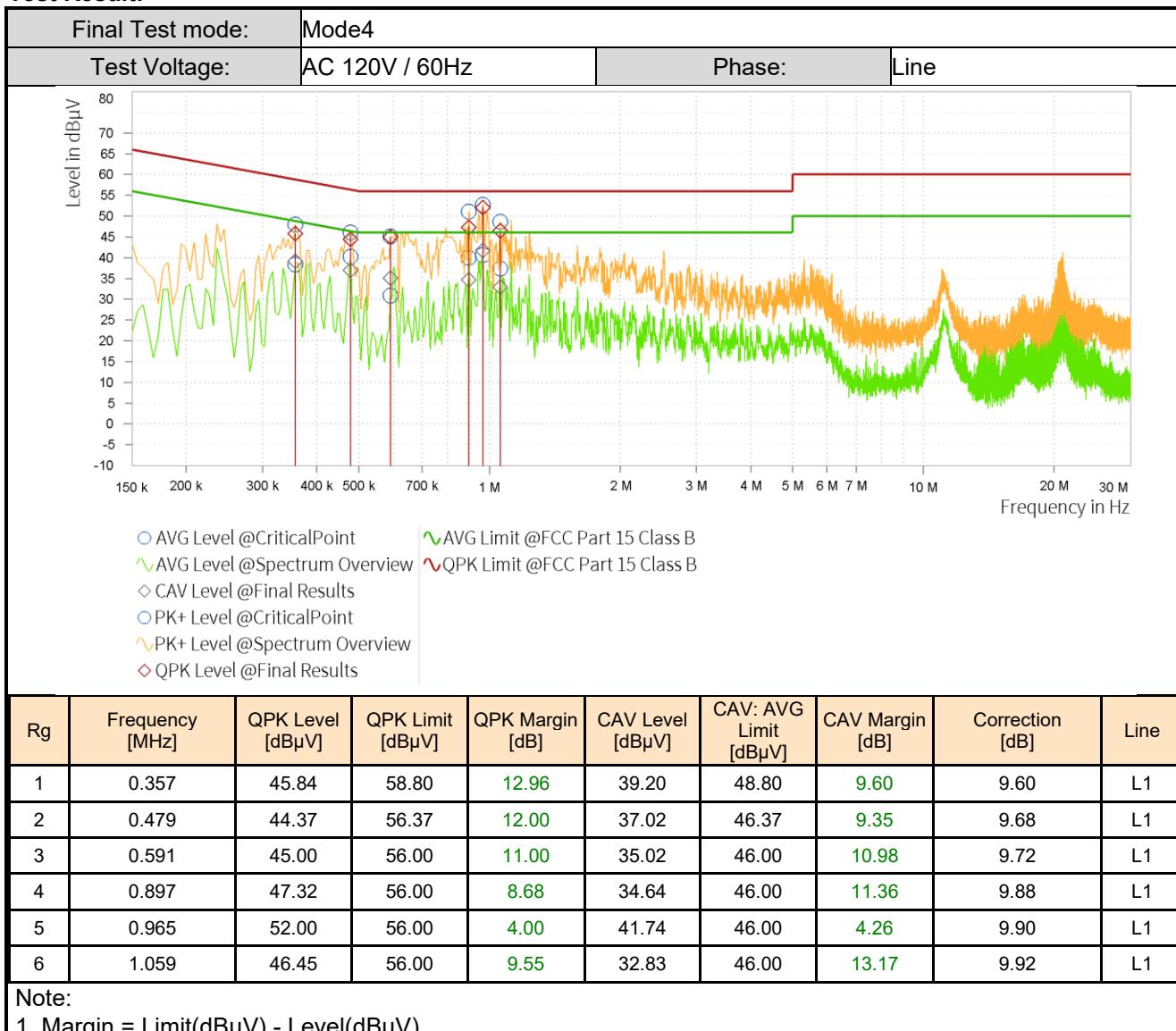
ANSI C63.4-2014.

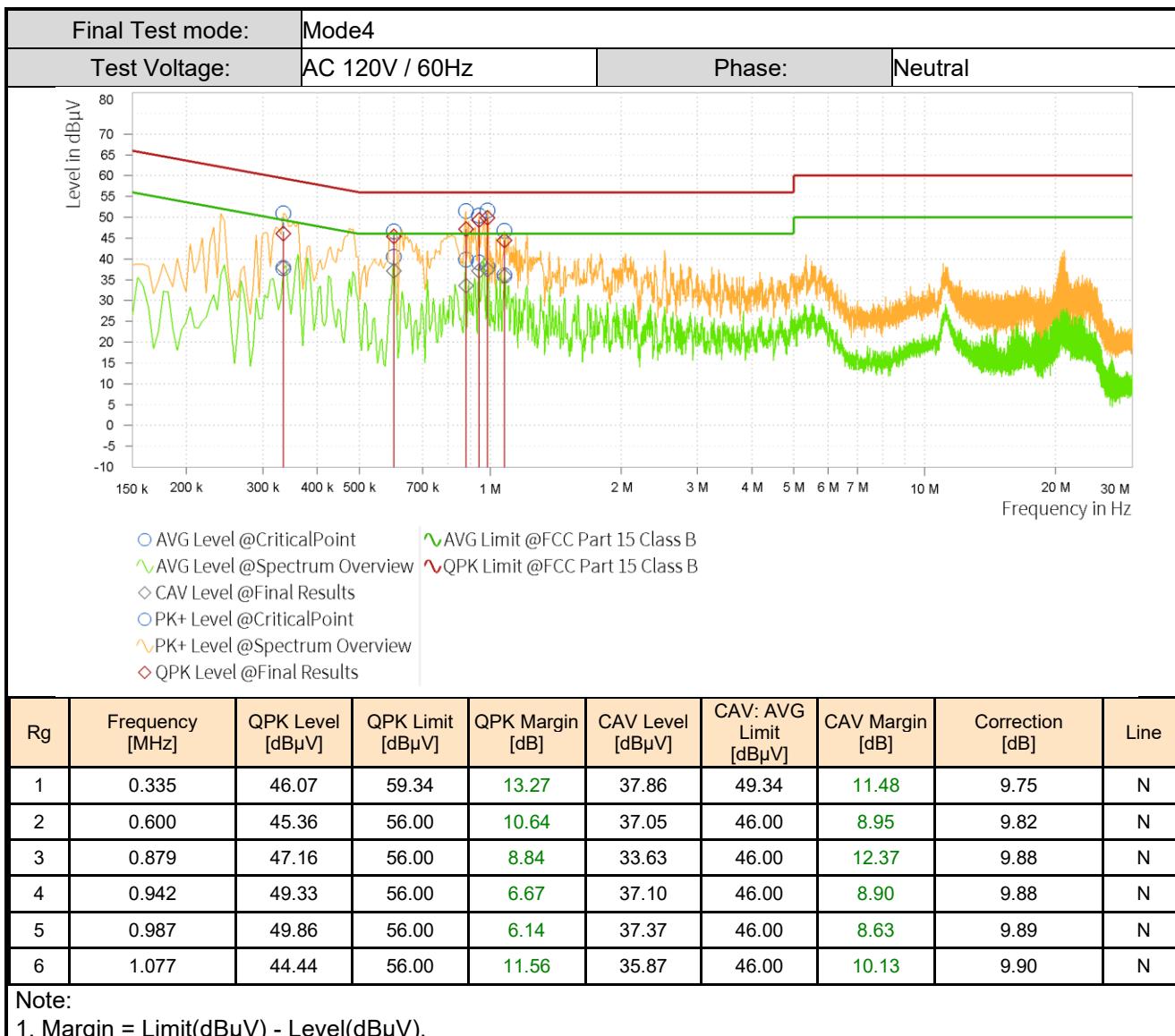
Test Settings

1. The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu H + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
2. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.
3. The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
4. Set the test-receiver system to Peak detect function and specified bandwidth (if bandwidth =9kHz) with maximum hold mode. Then measurement is also conducted by average detector and Quasi-Peak detector function respectively.
5. Both sides of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4 on conducted measurement.

Test SetupMeasuring Instruments

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

Test Result:



4.2 Radiated Emissions

Limits

Frequency	Field strength ($\mu\text{V/m}$)	Limit ($\text{dB}\mu\text{V/m}$)	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 measurement, the EUT shall be placed on a RF-transparent table or support at a nominal height of 80cm above the reference 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:

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

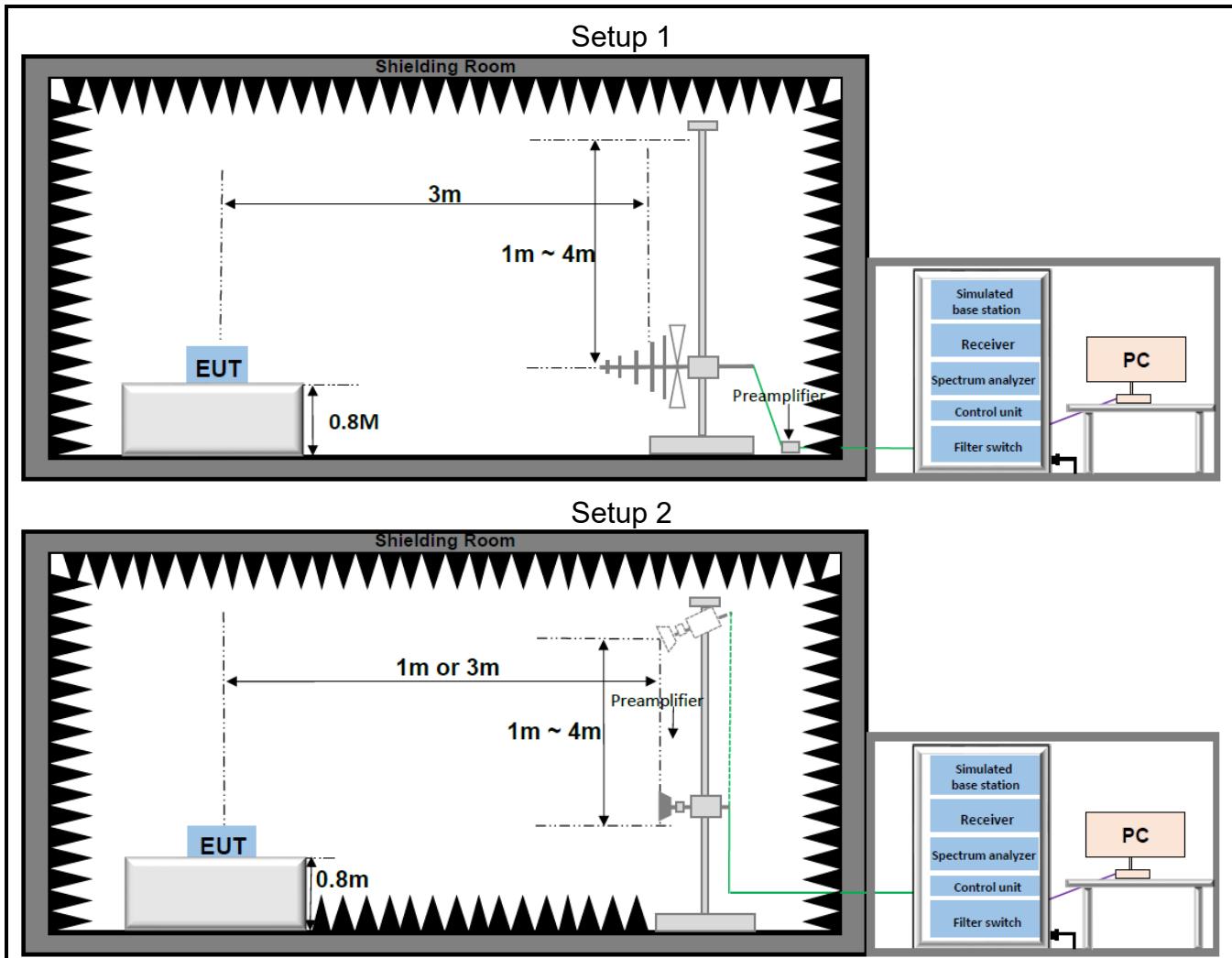
$$\text{AF} = \text{Antenna Factor}(\text{dB}/\text{m})$$

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

$$\text{Margin} = \text{Limit}(\text{dB}\mu\text{V}/\text{m}) - \text{Level}(\text{dB}\mu\text{V}/\text{m})$$
- Repeat above procedures until all frequencies measured was complete.
- Measure and record the results in the test report.

Test notes

- 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 within 20dB of the limit above 18GHz.

Test SetupMeasuring Instruments

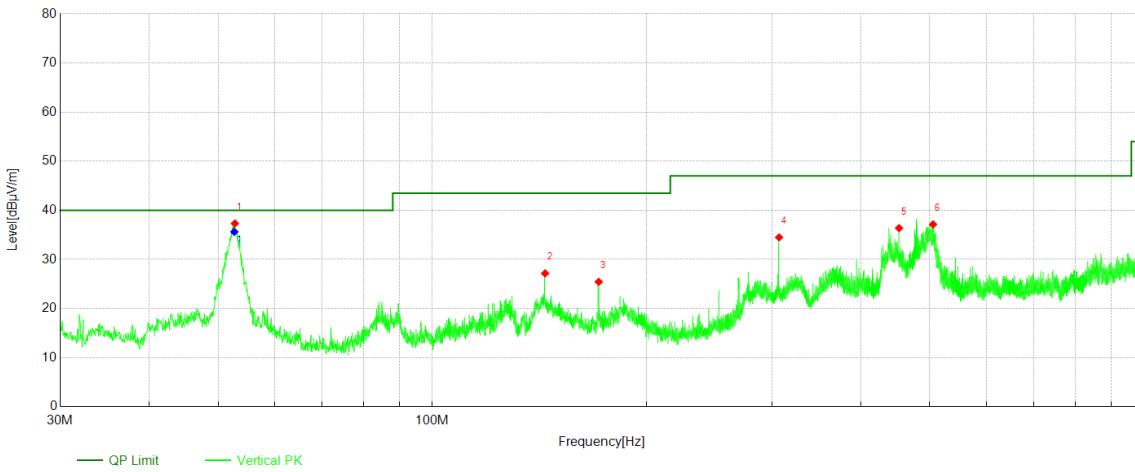
The measuring equipment is listed in the section 3.1 of this test report.

Test Result for TACH4NA capacitor 1(TLJT107M010R0900):

Test Frequency	Below 1000MHz	Final Test mode:	Mode 3					
Test Voltage:	AC 120V/60Hz	Polarization:	Horizontal					
QP Limit	Horizontal PK	QP Detector						
Data List								
NO.	Freq. [MHz]	Reading [dB μ V]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Verdict
1	52.46	50.11	-22.06	28.05	40.00	11.95	Horizontal	PASS
2	171.38	52.01	-24.14	27.87	43.50	15.63	Horizontal	PASS
3	187.29	50.37	-24.31	26.06	43.50	17.44	Horizontal	PASS
4	253.10	53.11	-21.07	32.04	47.00	14.96	Horizontal	PASS
5	307.13	53.06	-19.26	33.80	47.00	13.20	Horizontal	PASS
6	479.55	49.29	-8.36	40.93	47.00	6.07	Horizontal	PASS

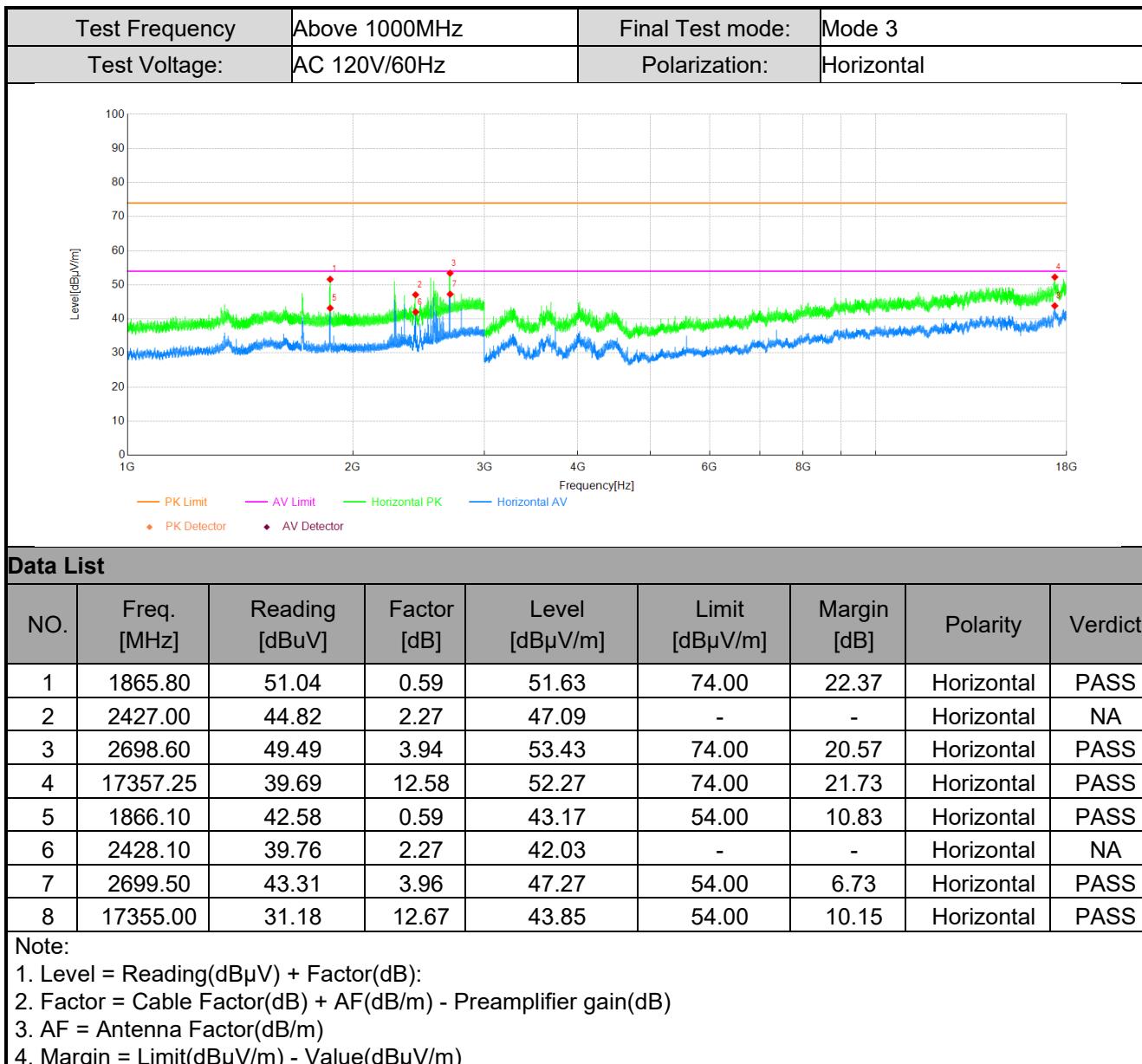
Note:

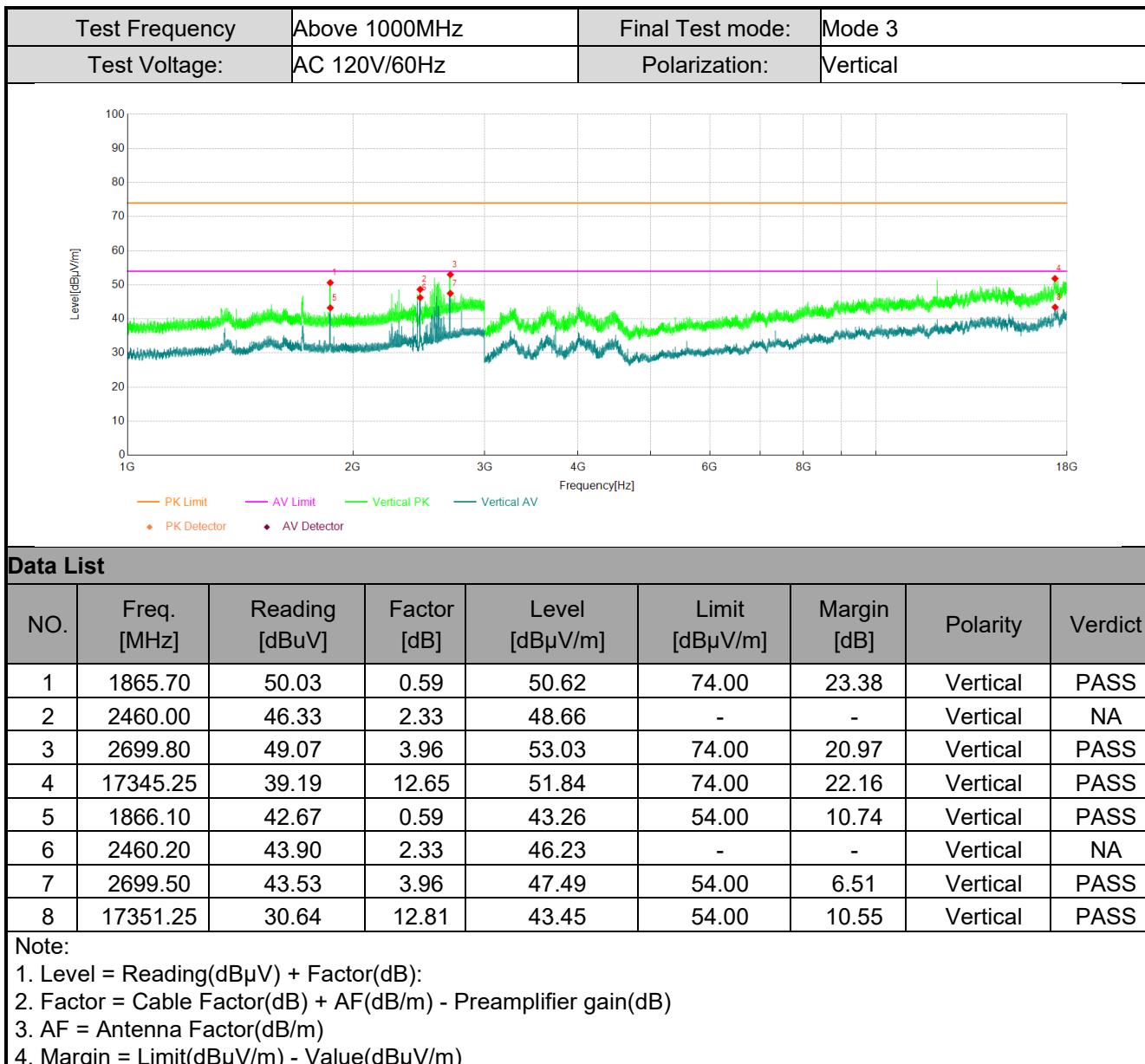
1. Level = Reading(dB μ V) + Factor(dB);
2. Factor = Cable Factor(dB) + AF(dB/m) - Preamplifier gain(dB)
3. AF = Antenna Factor(dB/m)
4. Margin = Limit(dB μ V/m) - Value(dB μ V/m)

Test Frequency	Below 1000MHz	Final Test mode:	Mode 3					
Test Voltage:	AC 120V/60Hz	Polarization:	Vertical					
								
Data List								
NO.	Freq. [MHz]	Reading [dB μ V]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Verdict
1	52.80	59.83	-22.51	37.32	40.00	2.68	Vertical	PASS
2	144.02	52.38	-25.22	27.16	43.50	16.34	Vertical	PASS
3	171.33	49.62	-24.19	25.43	43.50	18.07	Vertical	PASS
4	307.08	54.05	-19.56	34.49	47.00	12.51	Vertical	PASS
5	452.73	45.89	-9.52	36.37	47.00	10.63	Vertical	PASS
6	505.25	46.63	-9.50	37.13	47.00	9.87	Vertical	PASS
Data List								
NO.	Freq. [MHz]	QP Reading [dB μ V]	QP Value [dB μ V/m]	QP Limit [dB μ V/m]	QP Margin [dB]	Polarity	Verdict	
1	52.7096	58.13	35.62	40.00	4.38	Vertical	PASS	

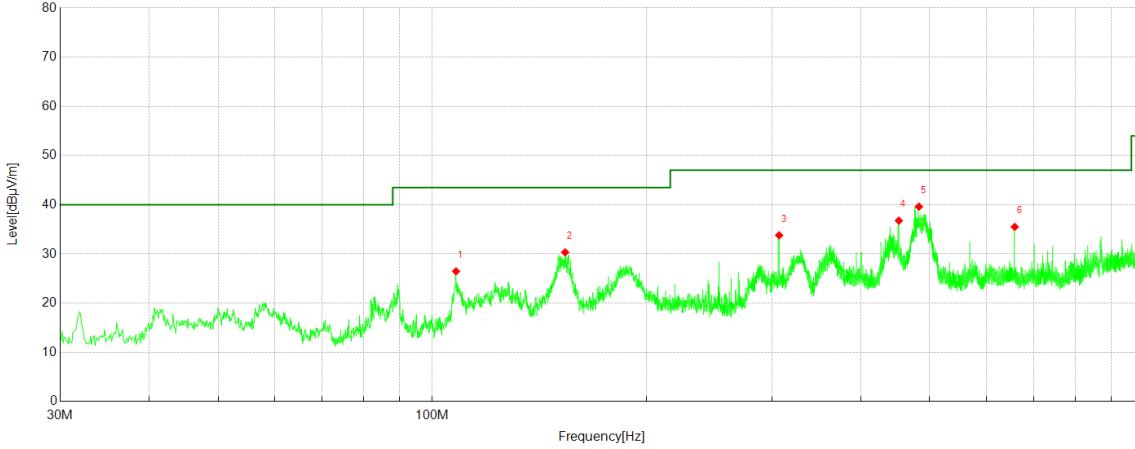
Note:

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



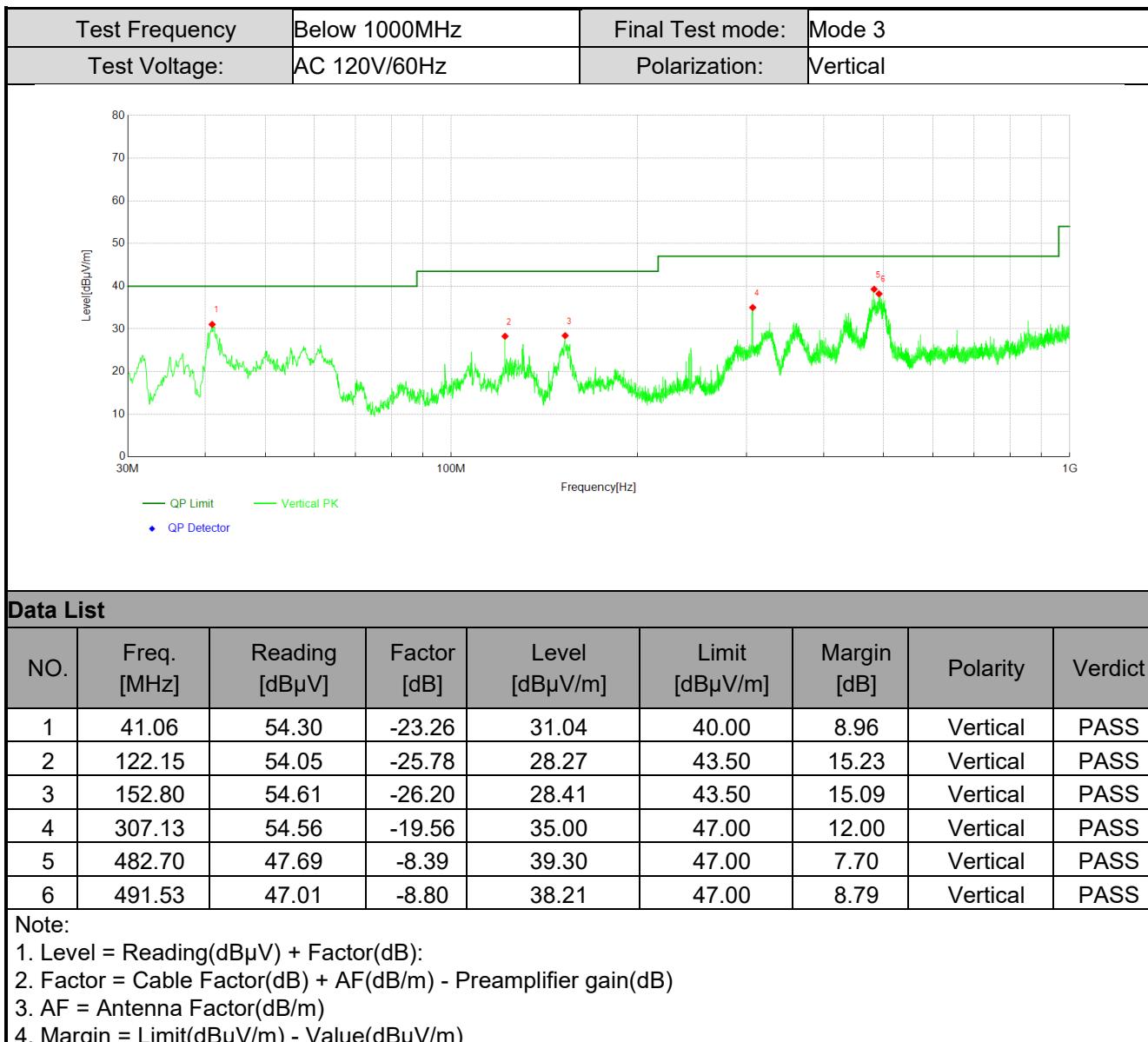


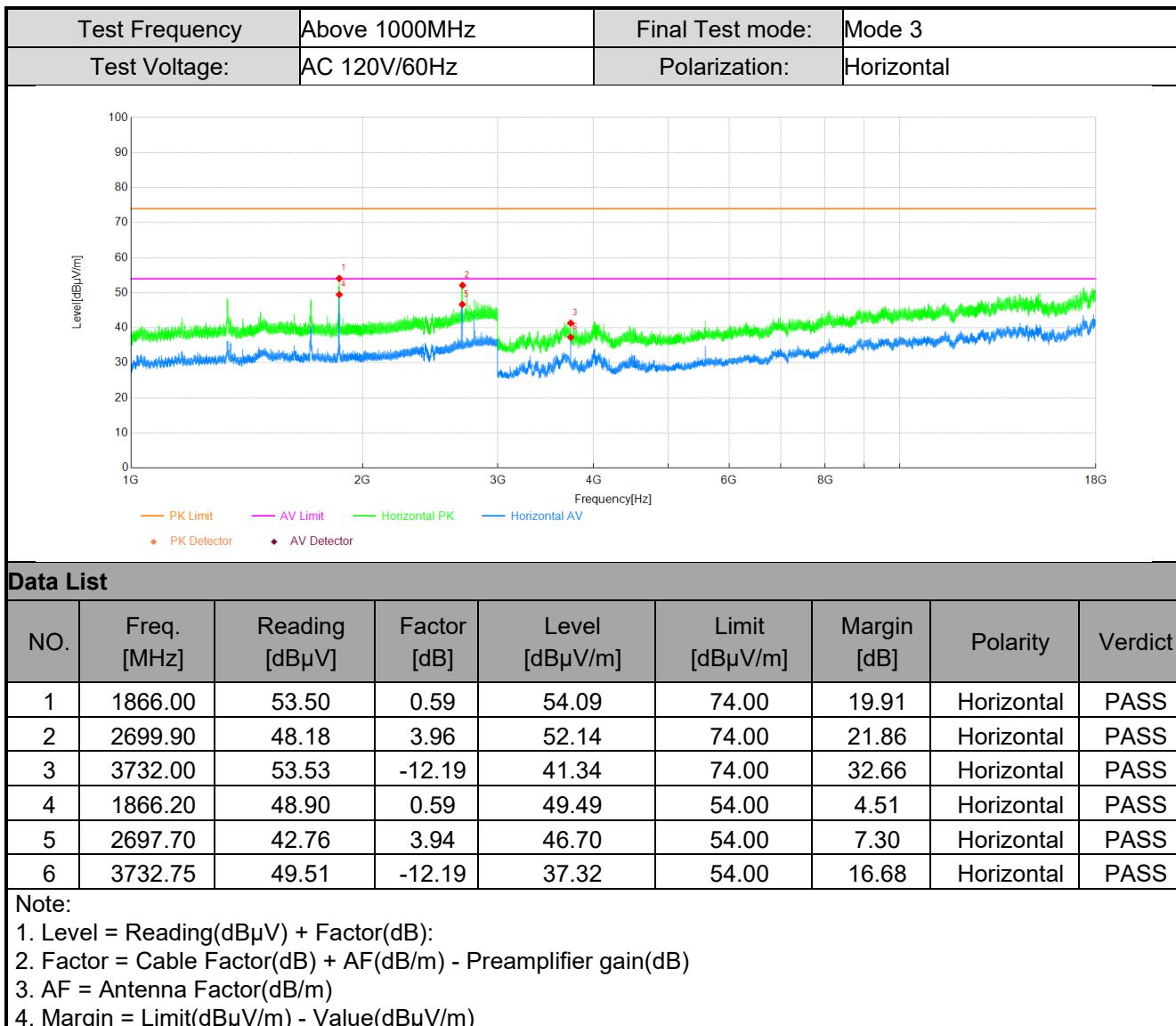
Test Result for TACH4NA capacitor 2(GRM31CR61A107MEA8L):

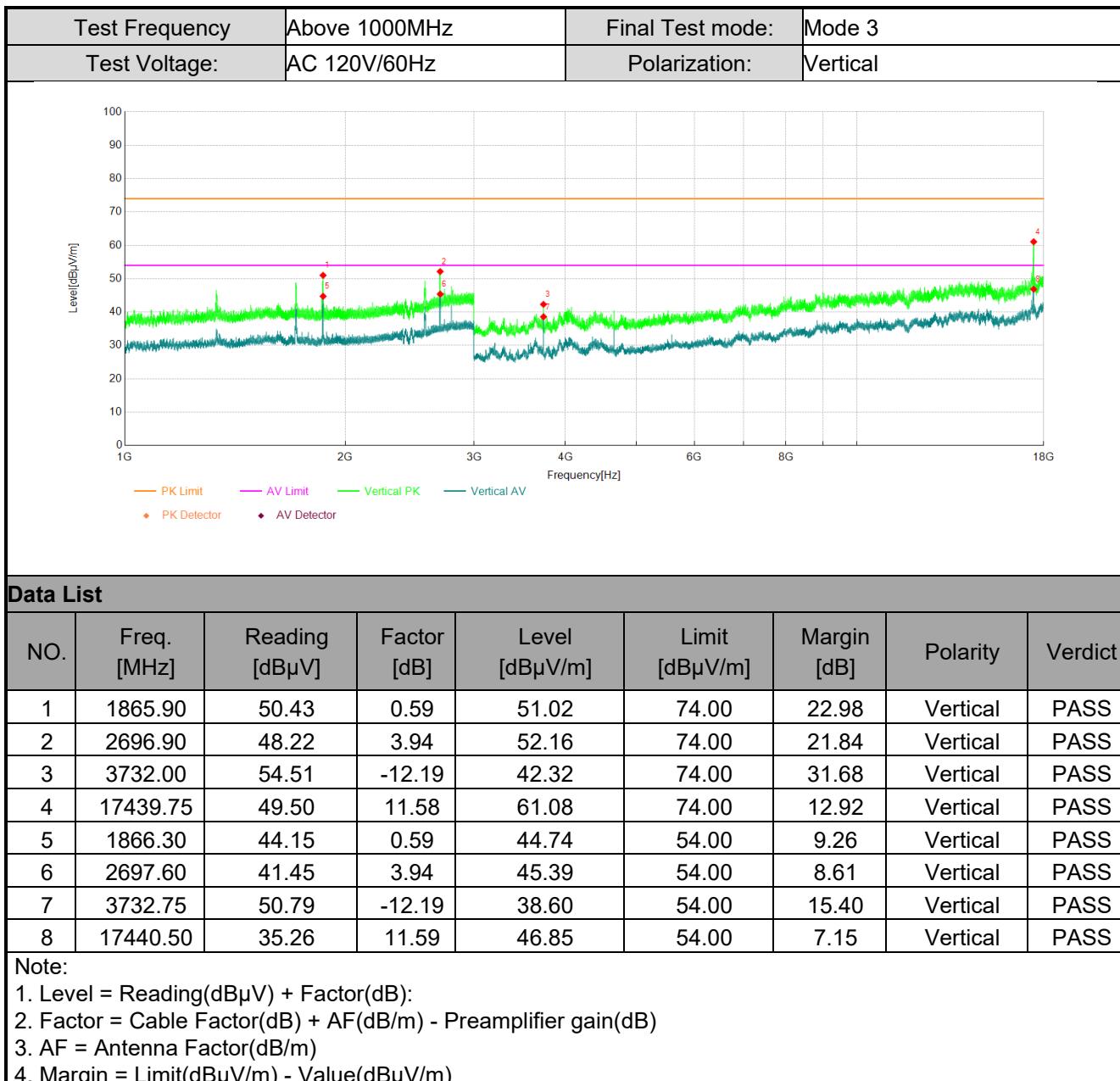
Test Frequency	Below 1000MHz	Final Test mode:	Mode 3					
Test Voltage:	AC 120V/60Hz	Polarization:	Horizontal					
								
Data List								
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Verdict
1	107.99	49.25	-22.78	26.47	43.50	17.03	Horizontal	PASS
2	153.68	56.37	-26.04	30.33	43.50	13.17	Horizontal	PASS
3	307.13	53.04	-19.26	33.78	47.00	13.22	Horizontal	PASS
4	452.34	46.00	-9.23	36.77	47.00	10.23	Horizontal	PASS
5	482.70	48.06	-8.44	39.62	47.00	7.38	Horizontal	PASS
6	658.17	46.99	-11.49	35.50	47.00	11.50	Horizontal	PASS

Note:

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







5 Test Setup Photos

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

~The End~