

TEST REPORT

Product Name: RUGGED
Trade Mark: 
Model No.: RUGGED-AACA-R01
HVIN: RUGGED-AACA-R01
Report Number: 2209071437EMC-1
Test Standards: FCC 47 CFR Part 15 Subpart B
ICES-003 Issue 7
FCC ID: 2AIKG-RUGGED
Test Result: PASS
Date of Issue: December 14, 2022

Prepared for:

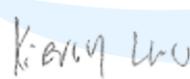
Vix Technology (Aust) Pty Ltd
Level 1, 50 St Georges Tce Perth, 6000 Australia

Prepared by:

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Date: December 14, 2022

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UTTR-EMC-ICES003-V1.2

Version

Version No.	Date	Description
V1.0	December 14, 2022	Original

**Shenzhen UnionTrust Quality and Technology Co., Ltd.**

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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Vix Technology (Aust) Pty Ltd
Address of Applicant:	Level 1, 50 St Georges Tce Perth, 6000 Australia
Manufacturer:	Vix Technology (Aust) Pty Ltd
Address of Manufacturer:	Level 1, 50 St Georges Tce Perth, 6000 Australia

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	RUGGED
Model No.:	RUGGED-AACA-R01
Add. Model No.:	See Note
HVIN:	RUGGED-AACA-R01
Trade Mark:	
DUT Stage:	Identical Prototype
Rated Voltage:	<input checked="" type="checkbox"/> Powered by POE port <input checked="" type="checkbox"/> Powered by AC/DC port
Classification of digital devices:	Class B
Highest Internal Frequency:	2.480 GHz
Sample Received Date:	September 1, 2022
Sample Tested Date:	October 13, 2022 to October 17, 2022

Note: The following is a breakdown of the EUT part numbers:



1: Defines the product name, in this case RUGGED for Rugged Validator.

2: Defines the mechanical configuration of the device. There is currently only one configuration available:
 A: Pole Mount

3: Defines the type of memory for the device. There is currently only one memory type available:
 A: 1GB DDR3L SDRAM and 2GB NAND Flash

4: Defines the optional features (Bar Code & QR Reader / 4G & 3G & 2G / 2.4GHz WiFi & Bluetooth) available in the model. Currently the following options are available:

- A: With Bar Code & QR Reader
- B: No added optional features (but no Touch Screen)
- C: With Bar Code & QR Reader / 4G & 3G & 2G / 2.4GHz WiFi & Bluetooth
- D: No added optional features (Standard model)
- E: With 2.4GHz WiFi & Bluetooth
- F: With 4G & 3G & 2G / 2.4GHz WiFi & Bluetooth
- G: With Bar Code & QR Reader / 2.4GHz WiFi & Bluetooth

Note: Different combinations may be added in the future, but their included features will still be within the ones available in the fully featured C variant listed above (i.e. Touch Screen / Bar code & QR reader / 4G & 3G & 2G / 2.4GHz WiFi & Bluetooth).

5: Defines the aesthetics and artwork for the device. Currently the following options are available:

- A: Standard Front Casing / Standard Rear Casing / Standard Glass Artwork
- B: Standard Front Casing / Standard Rear Casing / Custom-01 Glass Artwork

Note: Different options may be added in the future based on customer requirement.

6: Defines the device version number.

R01: Revision 1

The test device is the RUGGED-AACA-R01 model, which includes all optional electronics peripheral features. The test data is gathered from a production sample (RUGGED-AACA-R01), provided by the manufacturer.

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Manufacturer discrepancy declaration letter:**Assure Rugged Validator Model Variations Declaration****Assure Rugged Validator Model Variations Declaration**

We hereby confirm that the test report covers all the model numbers fall under **RUGGED-****-*****
Where the detailed explanation of the model number breakdown is as follows:



- 1: Defines the product name, in this case RUGGED for Rugged Validator.
- 2: Defines the mechanical configuration of the device. There is currently only one configuration available:
 - A: Pole Mount
- 3: Defines the type of memory for the device. There is currently only one memory type available:
 - A: 1GB DDR3L SDRAM and 2GB NAND Flash
- 4: Defines the optional features (Bar Code & QR Reader / 4G & 3G & 2G / 2.4GHz WiFi & Bluetooth) available in the model. Currently the following options are available:
 - A: With Bar Code & QR Reader
 - B: No added optional features (but no Touch Screen)
 - C: With Bar Code & QR Reader / 4G & 3G & 2G / 2.4GHz WiFi & Bluetooth
 - D: No added optional features (Standard model)
 - E: With 2.4GHz WiFi & Bluetooth
 - F: With 4G & 3G & 2G / 2.4GHz WiFi & Bluetooth
 - G: With Bar Code & QR Reader / 2.4GHz WiFi & Bluetooth

Note: Different combinations may be added in the future, but their included features will still be within the ones available in the fully featured C variant listed above (i.e. Touch Screen / Bar code & QR reader / 4G & 3G & 2G / 2.4GHz WiFi & Bluetooth).
- 5: Defines the aesthetics and artwork for the device. Currently the following options are available:
 - A: Standard Front Casing / Standard Rear Casing / Standard Glass Artwork
 - B: Standard Front Casing / Standard Rear Casing / Custom-01 Glass Artwork

Note: Different options may be added in the future based on customer requirement.
- 6: Defines the device version number.
R01: Revision 1

The device used for the compliance testing is the RUGGED-AACA-R01 model, which covers all the optional electronics peripheral features that are available to the Rugged Validator. There may be different model variants added in the future, but as per mentioned in the above detailed part number explanation, their optional electronics peripheral features will still be within the options included in the RUGGED-AACA-R01 model.

Should you have any questions or comments regarding this matter, please have my best attention.

Sincerely,

Jiali (Carrie) Huang
Senior Hardware Engineer

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Date: 21/11/2022

1.2.2 Description of Accessories

None.

1.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
Notebook	Lenovo	E450	SL10G10780	UnionTrust
Mouse	DELL	MS111	CN-011D3V-738	UnionTrust
Wireless Router	ASUA	RT-AC2200	2019AJ4850	UnionTrust
Docking station	UGREEN	N/A	N/A	UnionTrust
Power over Ethernet Injector	Cisco	MA-INJ-4	QS-6593-01N A02	Applicant

Support Cable

Cable No.	Description	Connector	Length(Meter)	Supplied by
1	Ethernet Cable	RJ45	1.5 Unshielded without ferrite	UnionTrust
2	Ethernet Cable	RJ45	2.0 Unshielded without ferrite	UnionTrust
3	Ethernet Cable	RJ45	5.0 Shielded without ferrite	UnionTrust
4	Cable	RS-232	1.8 Shielded with two ferrite	UnionTrust

1.4 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

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1.5 TEST FACILITY

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

CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

A2LA-Lab Certificate No.: 4312.01

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

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ISED Wireless Device Testing Laboratories

CAB identifier: CN0032

FCC Accredited Lab.

Designation Number: CN1194

Test Firm Registration Number: 259480

1.6 DEVIATION FROM STANDARDS

None.

1.7 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.8 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.9 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Measurement Uncertainty
1	Conducted emission 9kHz-150kHz	±3.2 dB
2	Conducted emission 150kHz-30MHz	±2.7 dB
3	Radiated emission 9kHz-30MHz	± 4.7 dB
4	Radiated emission 30MHz-1GHz	± 4.6 dB
5	Radiated emission 1GHz-18GHz	± 4.4 dB
6	Radiated emission 18GHz-26GHz	± 4.6 dB
7	Radiated emission 26GHz-40GHz	± 4.6 dB

2. TEST SUMMARY

FCC 47 CFR Part 15 Subpart B Test Cases			
Test Item	Test Requirement	Test Method	Result
Conducted Emission	FCC 47 CFR Part 15.107 ICES-003 Issue 7 Section 3.2.1	ANSI C63.4-2014	PASS
Radiated Emission	FCC 47 CFR Part 15.109 ICES-003 Issue 7 Section 3.2.2	ANSI C63.4-2014	PASS

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
<input checked="" type="checkbox"/>	3m SAC	ETS-LINDGREN	3m	N/A	Jan. 22, 2021	Jan. 21, 2024
<input checked="" type="checkbox"/>	Receiver	R&S	ESIB26	100114	Nov. 05, 2021	Nov. 04, 2022
<input checked="" type="checkbox"/>	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Nov. 11, 2021	Nov. 10, 2023
<input checked="" type="checkbox"/>	6dB Attenuator	Talent	RA6A5-N-18	18103001	Nov. 11, 2021	Nov. 10, 2023
<input checked="" type="checkbox"/>	Preamplifier	HP	8447F	2805A02960	Nov. 05, 2021	Nov. 04, 2022
<input checked="" type="checkbox"/>	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201541	Apr. 30, 2021	Apr. 29, 2023
<input checked="" type="checkbox"/>	Pre-amplifier	ETS-Lindgren	00118385	00201874	Nov. 06, 2021	Nov. 05, 2022
<input checked="" type="checkbox"/>	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	Nov. 14, 2020	Nov. 13, 2023
<input checked="" type="checkbox"/>	Pre-amplifier	ETS-Lindgren	00118384	00202652	Nov. 17, 2020	Nov. 16, 2022
<input checked="" type="checkbox"/>	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
<input checked="" type="checkbox"/>	Test Software	Audix	e3	Software Version: 9.160323		

Conducted Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
<input checked="" type="checkbox"/>	Receiver	R&S	ESR7	1316.3003K07-101181-K3	Nov. 05, 2021	Nov. 04, 2022
<input checked="" type="checkbox"/>	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	Nov. 05, 2021	Nov. 04, 2022
<input checked="" type="checkbox"/>	LISN	R&S	ESH2-Z5	860014/024	Nov. 05, 2021	Nov. 04, 2022
<input checked="" type="checkbox"/>	LISN	ETS-Lindgren	3816/2SH	00201088	Nov. 05, 2021	Nov. 04, 2022
<input checked="" type="checkbox"/>	Test Software	Audix	e3	Software Version: 9.160323		

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Environment Parameter	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (V)	Relative Humidity (%)
NV/NT	+15 to +35	Powered by POE Port or Powered by AC/DC Port	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment and Test sample

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (kPa)	Sample No.	Tested by
Conducted Emission	23.5	37.9	99.75	S20220901426-ZJA01/1	Davin Zhang
Radiated Emission	25.1	58.3	100.1		Fire Huo

4.2 TEST MODES

Test Item	EMI Test Modes
Radiated Emission	Test Mode1: AC120V/60Hz (AC-DC Power supply) + Normal operation Test Mode2: AC240V/50Hz (AC-DC Power supply) + Normal operation Test Mode3: AC120V/60Hz (POE) + Normal operation Test Mode4: DC 24V+ Normal operation
Conducted Emission	Test Mode1: AC120V/60Hz (AC-DC Power supply) + Normal operation Test Mode2: AC240V/50Hz (AC-DC Power supply) + Normal operation Test Mode3: AC120V/60Hz (POE) + Normal operation

Remark: The above test modes in boldface were the worst cases, only the test data of these modes were reported.

4.3 TEST SETUP

4.3.1 For Radiated Emissions test setup

Figure 1. 30MHz to 1GHz

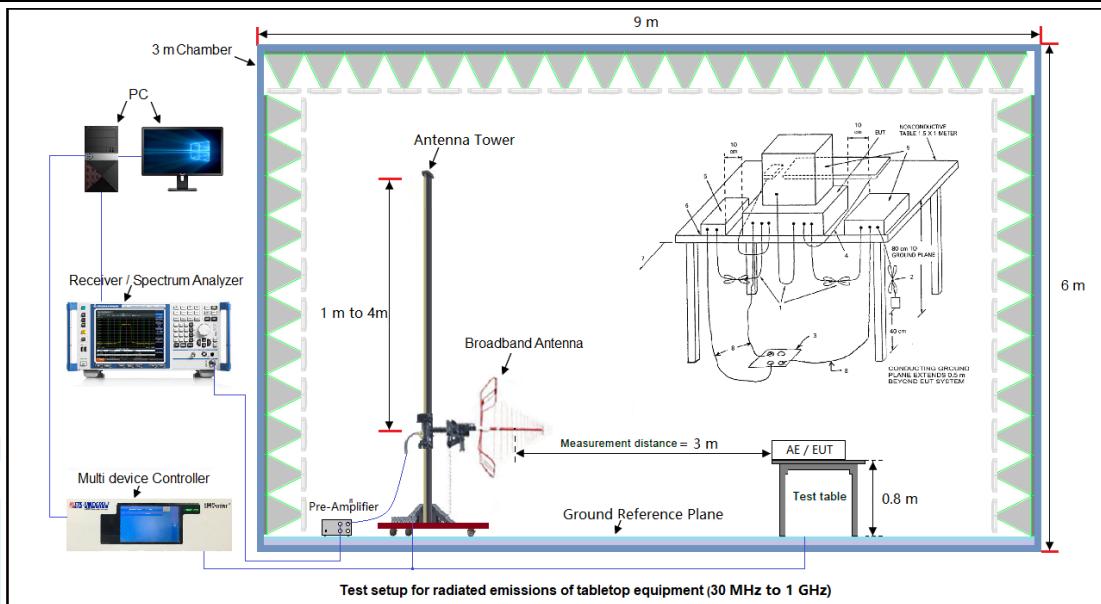
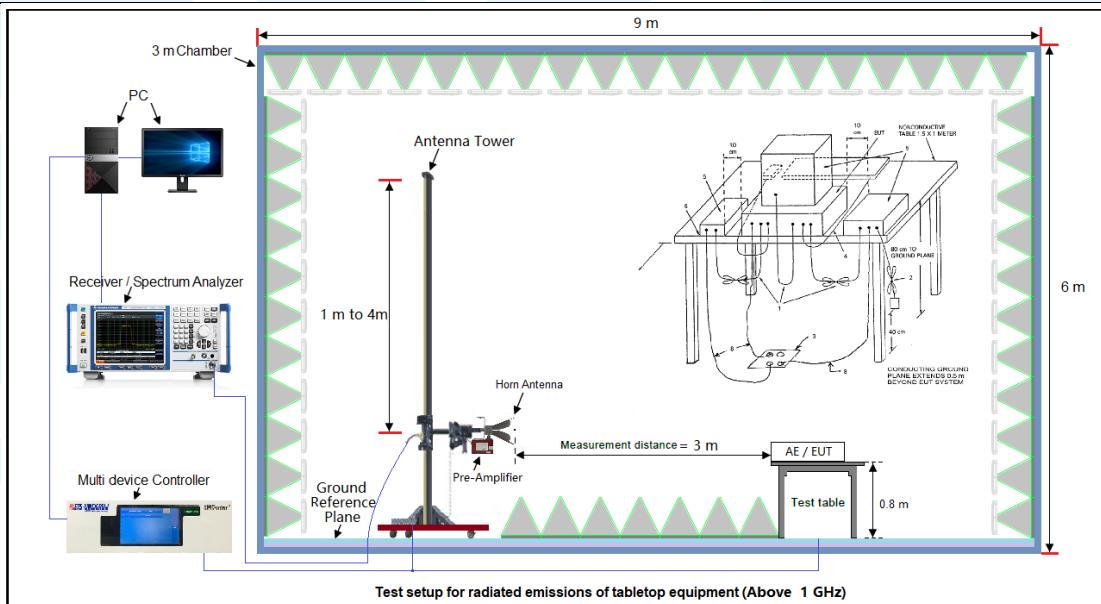
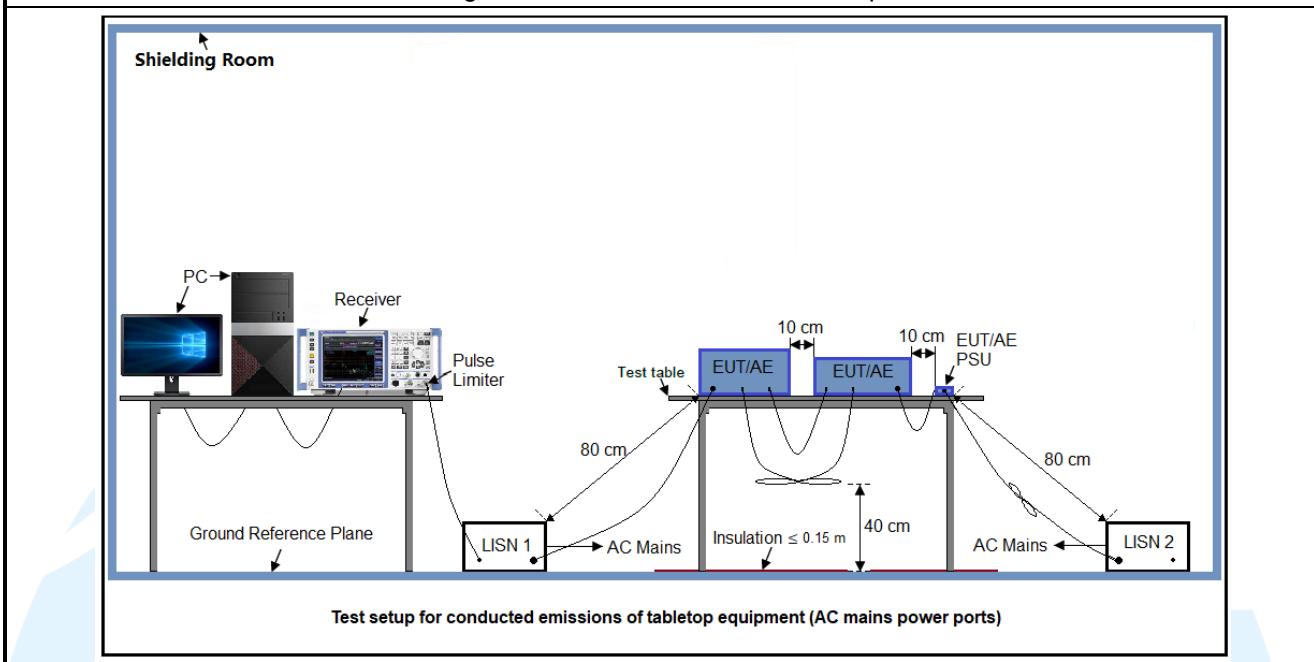


Figure 2. Above 1GHz



4.3.2 For Conducted Emissions test setup

Figure 3. Conducted Emissions setup



4.4 SYSTEM TEST CONFIGURATION

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000MHz. The resolution is 1 MHz or greater for frequencies above 1000MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic (according to KDB 896810 D02 SDoC FAQ v01r01) of the highest fundamental frequency or to 40 GHz, whichever is lower.

5. REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part15 Subpart B	Unintentional Radiators
2	ICES-003 Issue 7	Information Technology Equipment (Including Digital Apparatus)
3	ANSI C63.4-2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
4	KDB 174176 D01 Line Conducted FAQ v01r01	AC power-line conducted emission frequency asked questions
5	KDB 896810 D02 SDoC FAQ v01r02	Supplier's Declaration of Conformity frequency asked questions

6. EMC REQUIREMENTS SPECIFICATION

6.1 RADIATED EMISSION

Test Requirement: FCC 47 CFR Part 15.109
Test Method: ICES-003 Issue 7 Clause 3.2.2

Test Method: ANSI C63.4-2014

Receiver Setup:

Frequency: (f) (MHz)	Detector type	Measurement receiver bandwidth	
		RBW	VBW
30 ≤ f ≤ 1 000	Quasi Peak	120 kHz	300 kHz
f ≥ 1000	Peak	1 MHz	3 MHz
	Average	1 MHz	3 MHz

Measured frequency range

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.
1.705-108	1000.
108-500	2000.
500-1000	5000.
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

Limits:

Limits for Class B devices

FCC 47 CFR Part 15 Subpart B

Frequency (MHz)	limits at 3m (dB μ V/m)		
	QP Detector	PK Detector	AV Detector
30 – 88	40.0	--	--
88 – 216	43.5	--	--
216 – 960	46.0		
960 – 1000	54.0	--	--
Above 1000	--	74.0	54.0

ICES-003 Issue 7

Frequency (MHz)	limits at 3m (dB μ V/m)		
	QP Detector	PK Detector	AV Detector
30 – 88	40.0	--	--
88 – 216	43.5	--	--
216 – 230	46.0		

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230 – 960	47.0	--	--
960 – 1000	54.0	--	--
Above 1000	--	74.0	54.0

Remark:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dB μ V/m) = 20 log Emission level (μ V/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

Test Setup: Refer to section 4.3.1 for details.

Test Procedures:**1. From 30 MHz to 1GHz test procedure as below:**

- 1) The Product was placed on the non-conductive turntable 0.8 m above the ground at a chamber.
- 2) Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 120 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- 3) For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value.

2. Above 1GHz test procedure as below:

- 1) The Product was placed on the non-conductive turntable 0.8 m above the ground at a chamber.
- 2) Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- 3) For each frequency whose maximum record was higher or close to limit, measure its AV value: rotate the turntable from 0 to 360 degrees to find the degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to AV value and specified bandwidth with Maximum Hold Mode, and record the maximum value.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

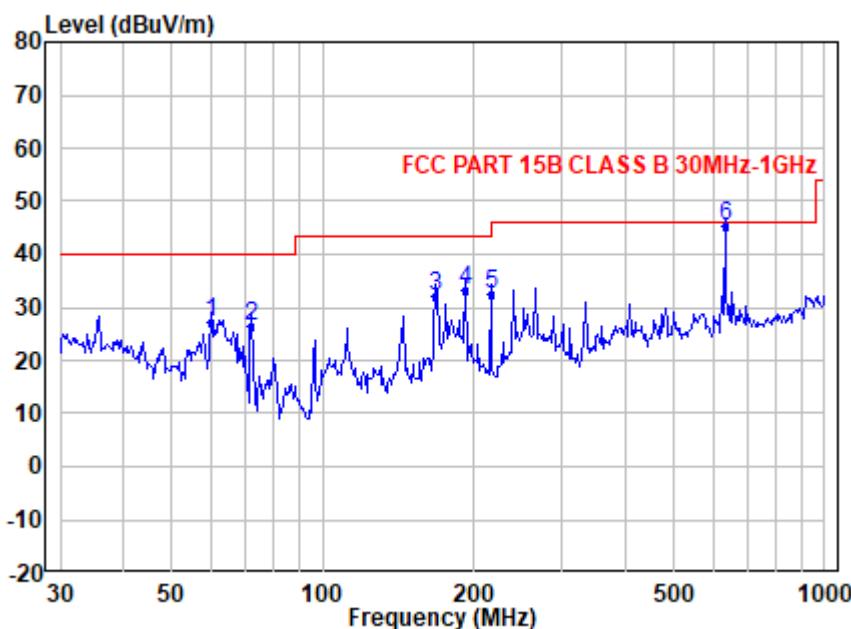
The measurement data as follows:

The worst measurement data for FCC 47 CFR Part 15 Subpart B as follows:

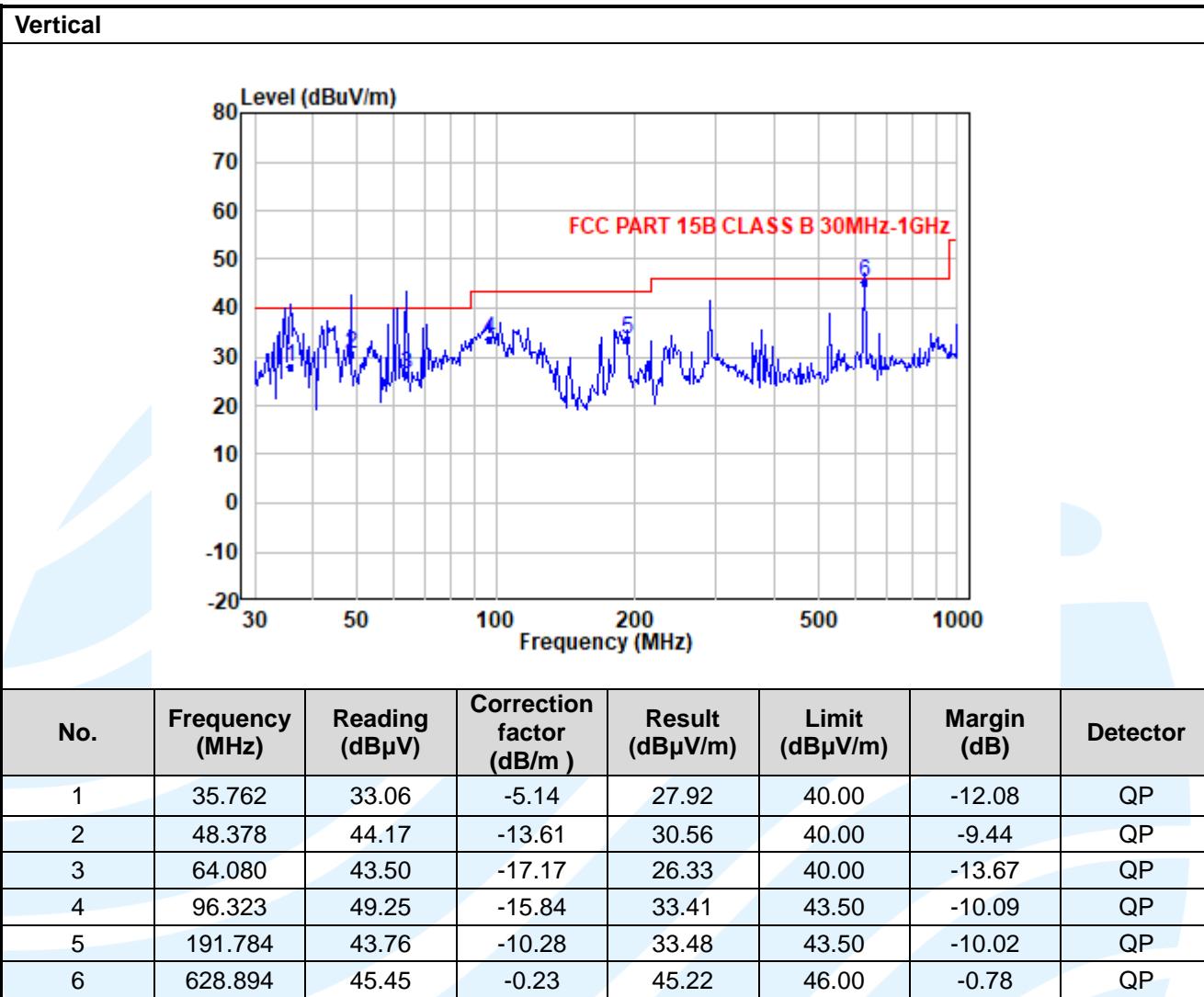
Below 1GHz(Quasi Peak):

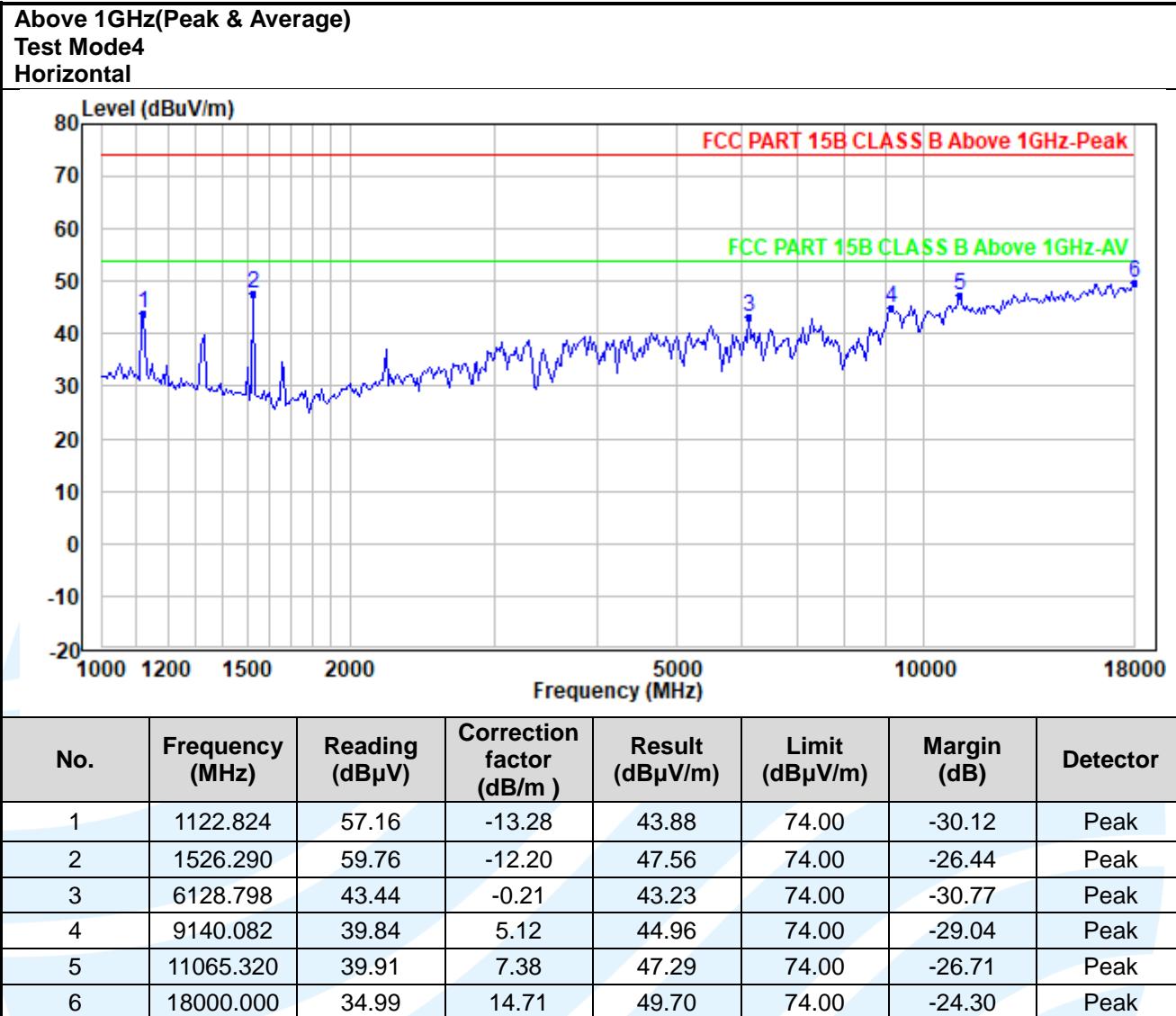
Test Mode1

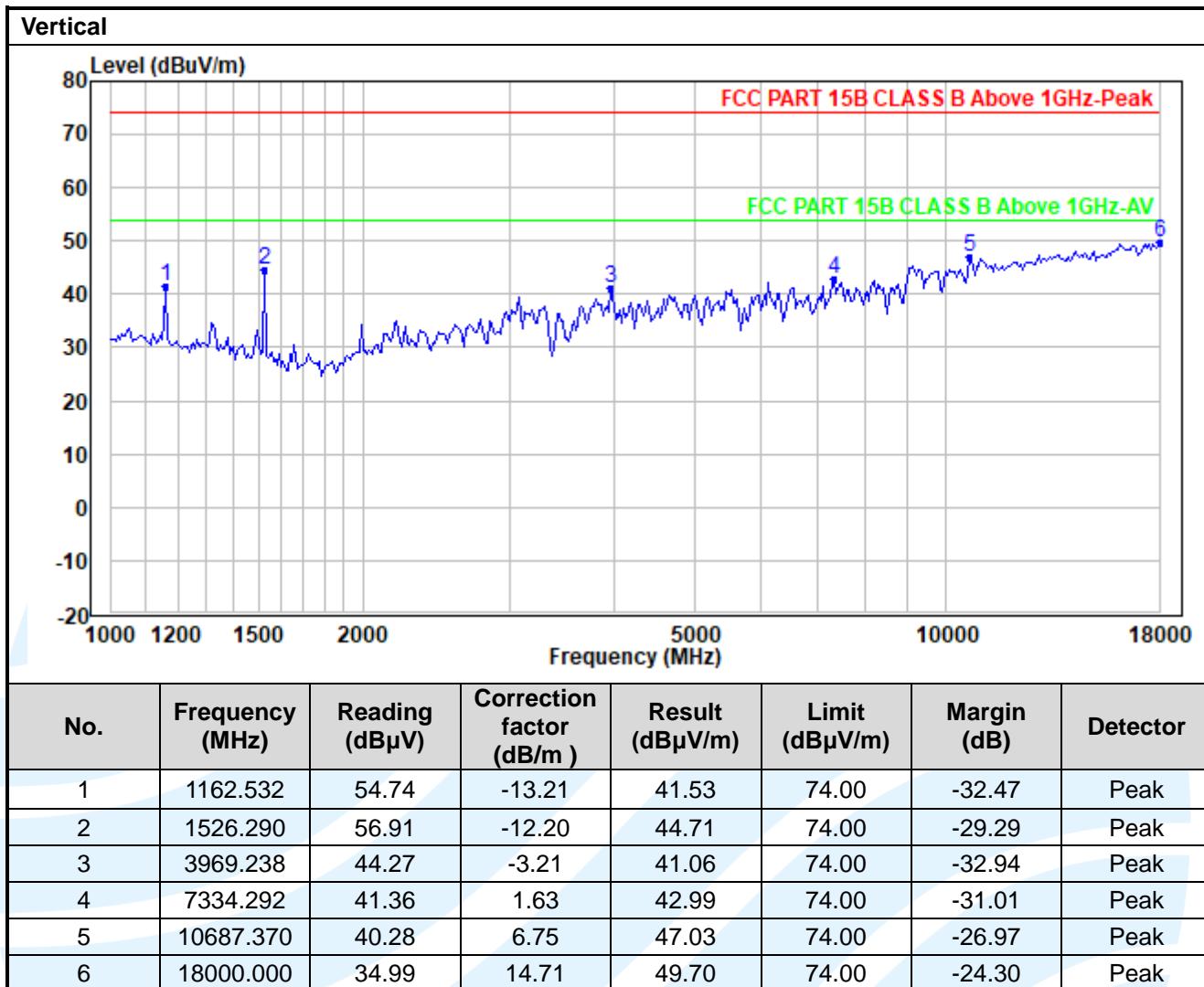
Horizontal



No.	Frequency (MHz)	Reading (dB μ V)	Correction factor (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector
1	59.732	44.51	-17.37	27.14	40.00	-12.86	QP
2	72.211	44.09	-17.50	26.59	40.00	-13.41	QP
3	167.814	44.18	-12.01	32.17	43.50	-11.33	QP
4	191.784	43.54	-10.28	33.26	43.50	-10.24	QP
5	216.120	43.24	-10.98	32.26	46.00	-13.74	QP
6	633.328	45.36	-0.10	45.26	46.00	-0.74	QP







Remark:

1. Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result – Limit
4. All possible modes of operation were investigated, and testing at all voltages, only the worst case emissions reported.
5. For Radiated Emission above 18GHz, there was not any unwanted emission detected.
6. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.
7. The limit of ICES-003 in the 230MHz to 960MHz band is higher than that of FCC Part 15B, so the radiation emission test data conform to the limit of ICES-003.

6.2 CONDUCTED EMISSION

Test Requirement: FCC 47 CFR Part 15.107
Test Method: ICES-003 Issue 7 Section 3.2.1
Test Method: ANSI C63.4-2014

Limits:

Limits for Class B devices

Frequency range (MHz)	Limits (dB(μV))	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

Remark:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

Test Setup: Refer to section 4.3.2 for details.

Test Procedures:

- 1) The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).
- 2) The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.
- 3) For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

Equipment Used: Refer to section 3 for details.

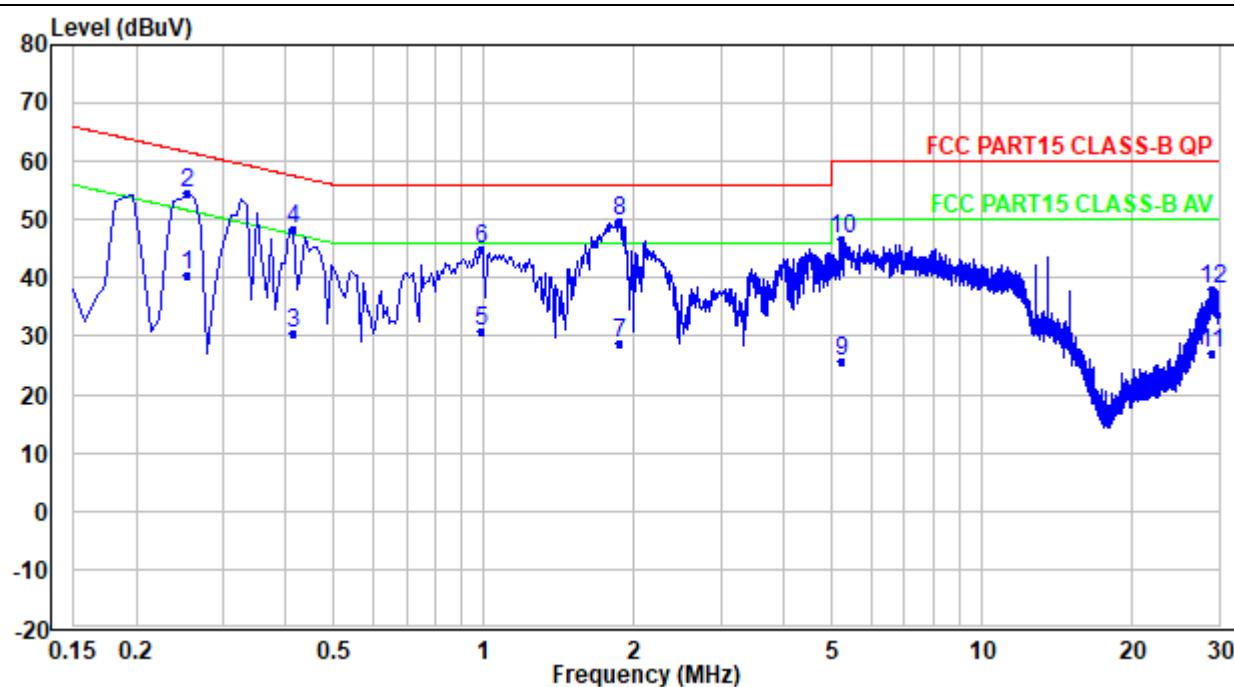
Test Result: Pass

The worst measurement data as follows:

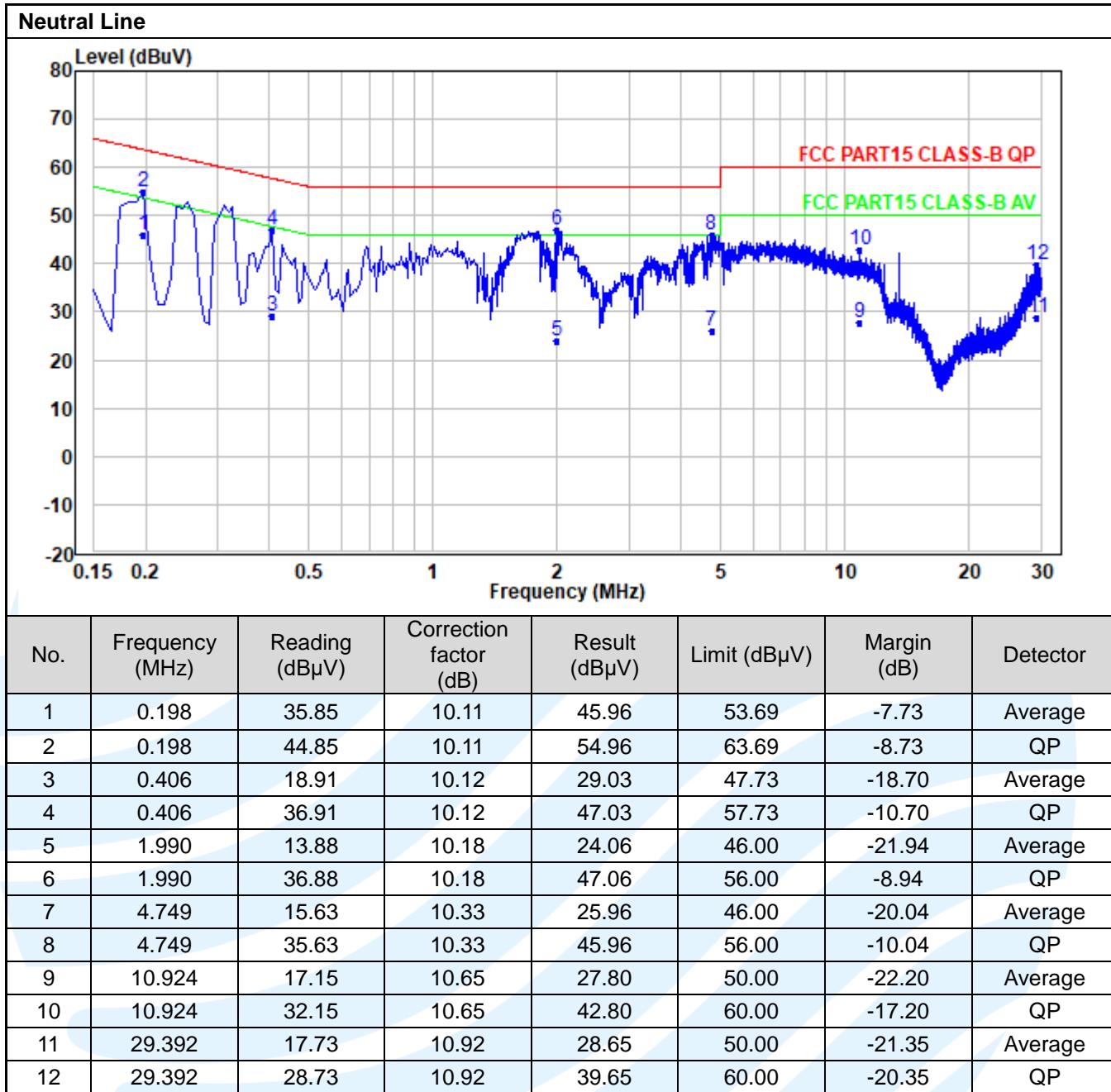
Quasi Peak and Average:

Test Mode2

Live Line



No.	Frequency (MHz)	Reading (dB μ V)	Correction factor (dB)	Result (dB μ V)	Limit (dB μ V)	Margin (dB)	Detector
1	0.254	30.49	10.13	40.62	51.63	-11.01	Average
2	0.254	44.49	10.13	54.62	61.63	-7.01	QP
3	0.414	20.23	10.13	30.36	47.57	-17.21	Average
4	0.414	38.23	10.13	48.36	57.57	-9.21	QP
5	0.990	20.80	10.22	31.02	46.00	-14.98	Average
6	0.990	34.80	10.22	45.02	56.00	-10.98	QP
7	1.878	18.69	10.23	28.92	46.00	-17.08	Average
8	1.878	39.69	10.23	49.92	56.00	-6.08	QP
9	5.245	15.29	10.34	25.63	50.00	-24.37	Average
10	5.245	36.29	10.34	46.63	60.00	-13.37	QP
11	29.040	16.29	10.94	27.23	50.00	-22.77	Average
12	29.040	27.29	10.94	38.23	60.00	-21.77	QP



Remark:

1. Correct Factor = LISN Factor + Cable Loss + Pulse Limiter Factor, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result - Limit
4. An initial pre-scan was performed on the Phase and neutral lines with peak detector. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.
5. All the above conducted emission data, the NFC fundamental frequency is not marked, it may exceed the limit, please ignore it.

APPENDIX 1 PHOTOS OF TEST SETUP

See test photos attached in Appendix 1 for the actual connections between Product and support equipment.

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photos.

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

The test report is effective only with both signature and specialized stamp. The result(s) shown in this report refer only to the sample(s) tested. Without written approval of UnionTrust, this report can't be reproduced except in full.
