FCC & ISED TEST REPORT

Product Name:	Vision MARK-1
Trade Mark:	N/A
Model No. / HVIN:	Vision MARK-1
Report Number:	210125061EMC-1
Test Standards:	FCC 47 CFR Part 15 Subpart B ICES-003 Issue 7
Test Result:	PASS
Date of Issue:	May 7, 2021

Prepared for:

Insituware LLC
107 Gilbreth Pkwy, Suite #202, Mullica Hill, NJ 08062

Prepared by:

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UnionTrust Laboratories *Certified*

Version

Version No.	Date	Description
V1.0	May 7, 2021	Original

CONTENTS

1. GENERAL INFORMATION 4
   1.1 CLIENT INFORMATION 4
   1.2 EUT INFORMATION 4
      1.2.1 GENERAL DESCRIPTION OF EUT 4
      1.2.2 DESCRIPTION OF ACCESSORIES 4
   1.3 DESCRIPTION OF SUPPORT UNITS 5
   1.4 TEST LOCATION 5
   1.5 TEST FACILITY 5
   1.6 DEVIATION FROM STANDARDS 5
   1.7 ABNORMALITIES FROM STANDARD CONDITIONS 5
   1.8 OTHER INFORMATION REQUESTED BY THE CUSTOMER 5
   1.9 MEASUREMENT UNCERTAINTY 6
2. TEST SUMMARY 7
3. EQUIPMENT LIST 8
4. TEST CONFIGURATION 9
   4.1 ENVIRONMENTAL CONDITIONS FOR TESTING 9
      4.1.1 NORMAL OR EXTREME TEST CONDITIONS 9
      4.1.2 RECORD OF NORMAL ENVIRONMENT 9
   4.2 TEST MODES 9
   4.3 TEST SETUP 10
      4.3.1 FOR RADIATED EMISSIONS TEST SETUP 10
      4.3.2 FOR CONDUCTED EMISSIONS TEST SETUP 11
   4.4 SYSTEM TEST CONFIGURATION 11
5. REFERENCE DOCUMENTS FOR TESTING 12
6. EMC REQUIREMENTS SPECIFICATION 12
   6.1 RADIATED EMISSION 12
   6.2 CONDUCTED EMISSION 20

APPENDIX 1 PHOTOS OF TEST SETUP 23
APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS 23

1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Insituware LLC
Address of Applicant:	107 Gilbreth Pkwy, Suite #202, Mullica Hill, NJ 08062
Manufacturer:	Insituware LLC
Address of Manufacturer:	107 Gilbreth Pkwy, Suite #202, Mullica Hill, NJ 08062

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Vision MARK-1
Model No. / HVIN:	Vision MARK-1
Trade Mark:	N/A
DUT Stage:	Production Unit
Rated Voltage:	☒ Battery: 3.7 VDC (1x3.7 V Lithium-ion Polymer Battery)
	☒ 100-240V~50/60Hz
	☒ Powered by USB port
Classification of digital devices:	Class B
Highest Internal Frequency:	5825 MHz
Sample Received Date:	January 26, 2021
Sample Tested Date:	March 16, 2021 to March 17, 2021

1.2.2 Description of Accessories

Adapter	
Model No.:	GTM96180-1807-2.0
Input:	100-240 V~50/60 Hz 0.6 A
Output:	5.0 V ⎓ 3.6 A 18W
DC Cable:	1.20 Meter, Unshielded without ferrite
Manufacturer:	GlobTek Inc

Battery	
Model No.:	PR-CU-R295-V1
Battery Type:	Lithium-ion Polymer Battery
Rated Voltage:	3.7 Vdc
Limited Charge Voltage:	4.2 Vdc
Rated Capacity:	5000 mAh
Manufacturer:	AA Portable Power Corp (Battery Space)

1.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested independently

1.4 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China
Telephone: +86 (0) 755 2823 0888
Fax: +86 (0) 755 2823 0886

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/EN 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: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

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)**
☒	3M Chamber & Accessory Equipment	ETS-LINDGREN	3M	N/A	Jan. 22, 2021	Jan. 22, 2024
☒	Receiver	R&S	ESIB26	100114	Nov. 18, 2020	Nov. 17, 2021
☐	Loop Antenna	ETS-LINDGREN	6502	00202525	Nov. 14, 2020	Nov. 13, 2021
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Nov. 14, 2020	Nov. 13, 2021
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	Nov. 10, 2020	Nov. 9, 2021
☒	Preamplifier	HP	8447F	2805A02960	May. 30, 2020	May. 9, 2021
☐	Broadband Antenna (Pre-amplifier)	ETS-LINDGREN	3142E-PA	00201891	Nov. 18, 2020	Nov. 17, 2021
☐	6dB Attenuator	Talent	RA6A5-N-18	18103002	Nov. 14, 2020	Nov. 13, 2022
☐	Horn Antenna	ETS-LINDGREN	3117	00164202	May. 30, 2020	May. 29, 2021
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	Dec. 03, 2018	Dec. 03, 2021
☐	Horn Antenna	ETS-LINDGREN	3116C	00200180	Jun. 19, 2020	Jun. 18, 2021
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	Nov. 14, 2020	Nov. 13, 2021
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	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)**
☒	Receiver	R&S	ESR7	1316.3003K07 -101181-K3	Nov. 18, 2020	Nov. 17, 2021
☒	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	Nov. 18, 2020	Nov. 17, 2021
☒	LISN	R&S	ESH2-Z5	860014/024	Nov. 18, 2020	Nov. 17, 2021
☐	LISN	ETS-Lindgren	3816/2SH	00201088	Nov. 18, 2020	Nov. 17, 2021
☒	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 (%)
NT/NV	+15 to +35	120~240V	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (kPa)	Tested by
Conducted Emission	24.5	51	100.03	Tripp Jiang
Radiated Emission	25	43	100.37	Lucas Ouyang

4.2 TEST MODES

Test Item	EMI Test Modes
Radiated Emission	**Mode 1: Charging from 120 Vac + Normal Working** **Mode 2: Charging from 240 Vac + Normal Working** Mode 3: Battery + Normal Working
Conducted Emission	Mode 1: Charging from 120 Vac + Normal Working **Mode 2: Charging from 240 Vac + Normal Working**

4.3 TEST SETUP

4.3.1 For Radiated Emissions test setup

Figure 1. 30MHz to 1GHz

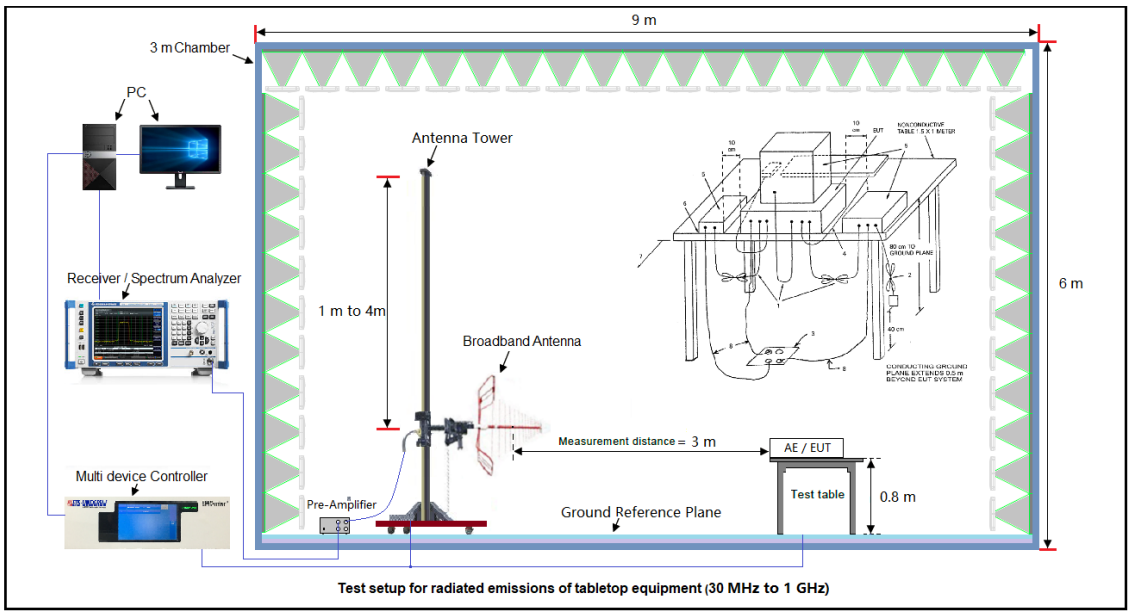
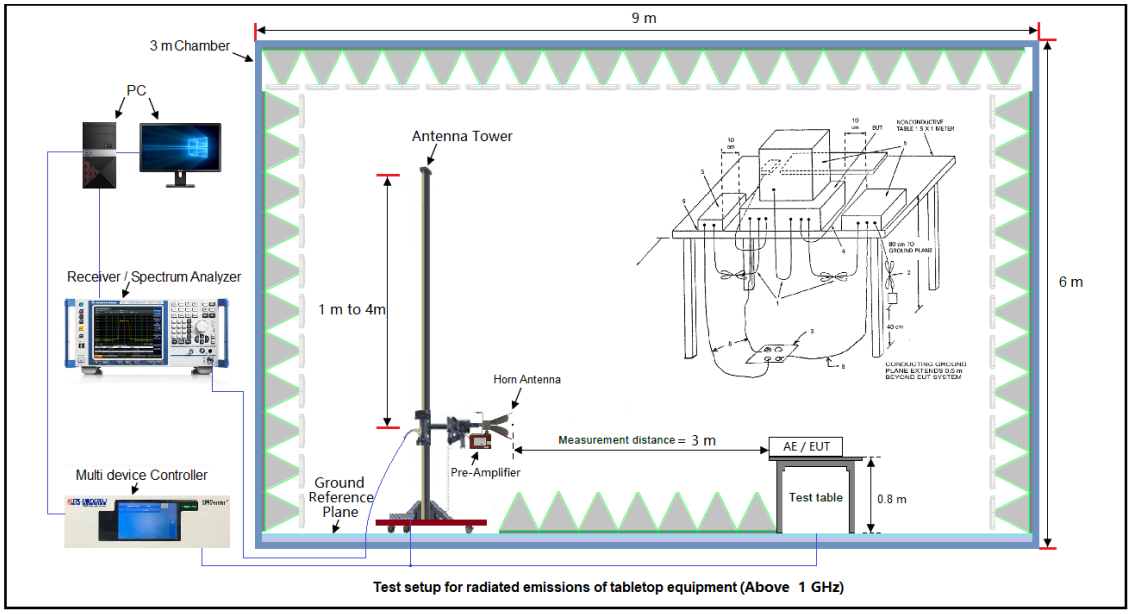
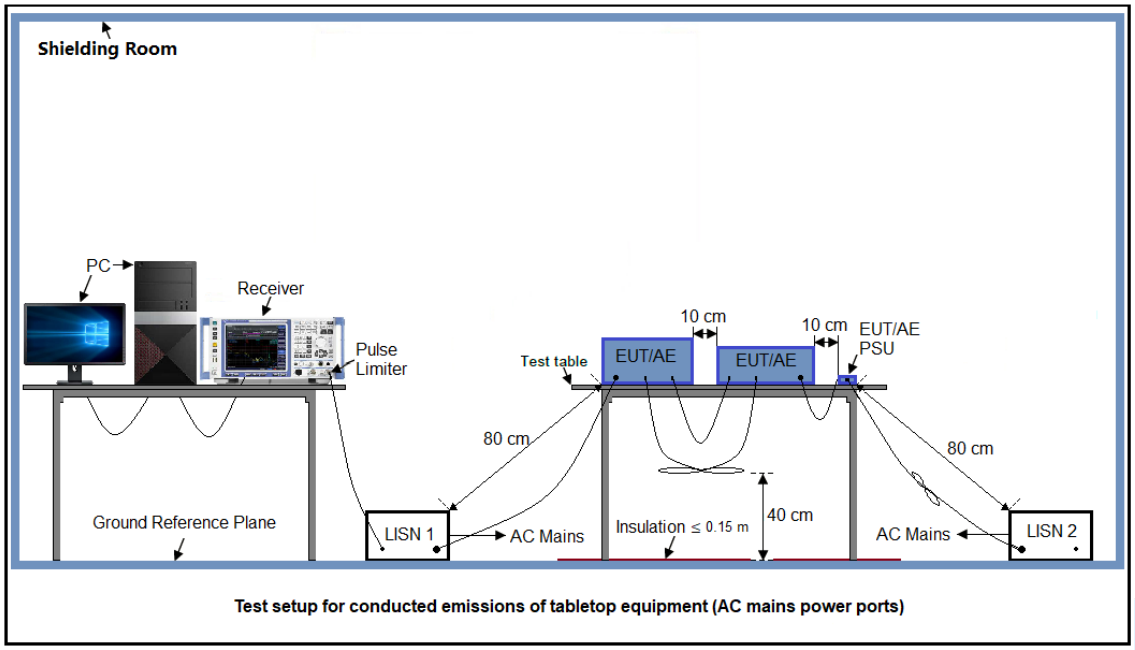


Figure 2. Above 1GHz



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
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 (dBμV/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 (dBμV/m)		
	QP Detector	PK Detector	AV Detector
30 – 88	40.0	--	--
88 – 216	43.5	--	--
216 – 230	46.0		

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 (dBμV/m) = 20 log Emission level (μV/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.

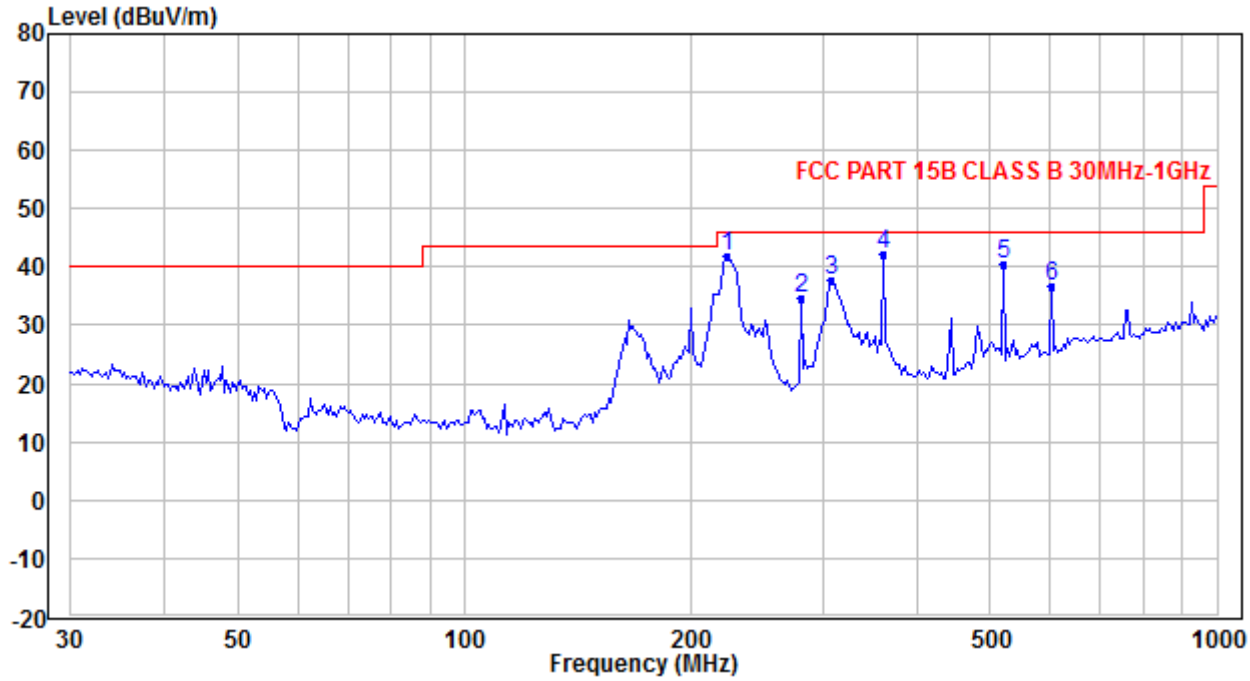
Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

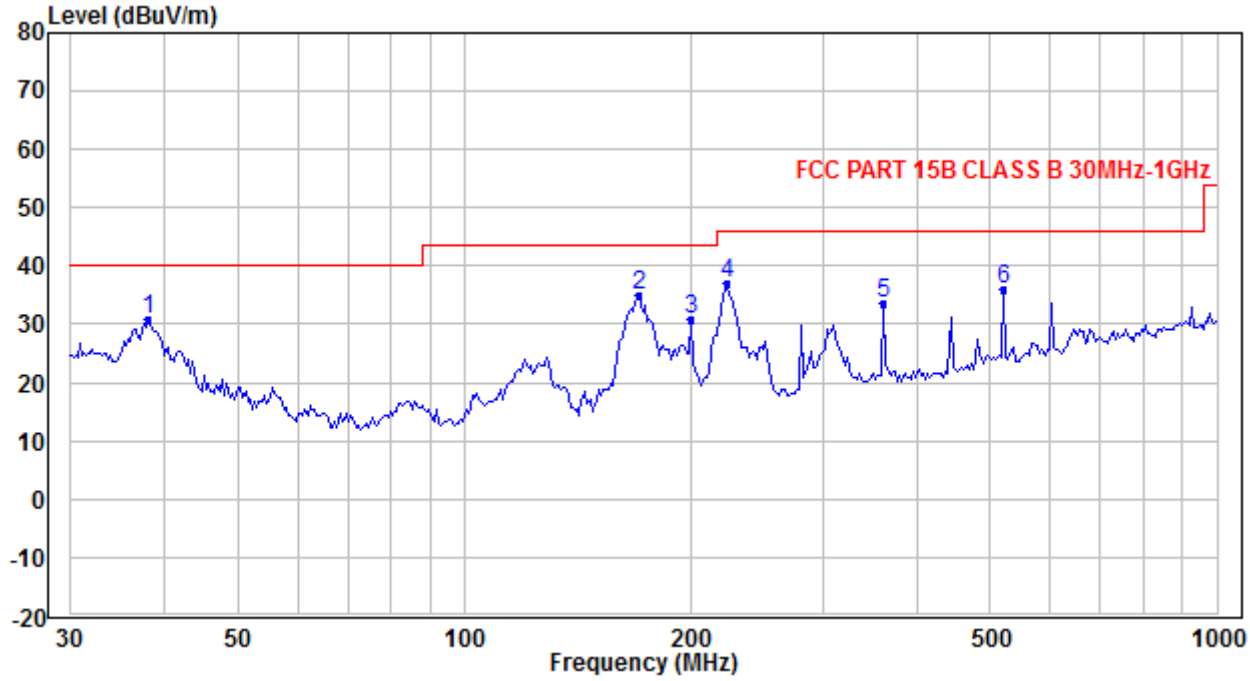
The measurement data for FCC 47 CFR Part 15 Subpart B as follows:

Below 1GHz(Quasi Peak):
Mode1
Horizontal



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	223.848	52.60	-10.70	41.90	46.00	-4.10	QP
2	280.294	42.08	-7.50	34.58	46.00	-11.42	QP
3	307.105	44.12	-6.33	37.79	46.00	-8.21	QP
4	360.977	47.63	-5.26	42.37	46.00	-3.63	QP
5	520.208	43.23	-2.63	40.60	46.00	-5.40	QP
6	602.929	37.44	-0.82	36.62	46.00	-9.38	QP

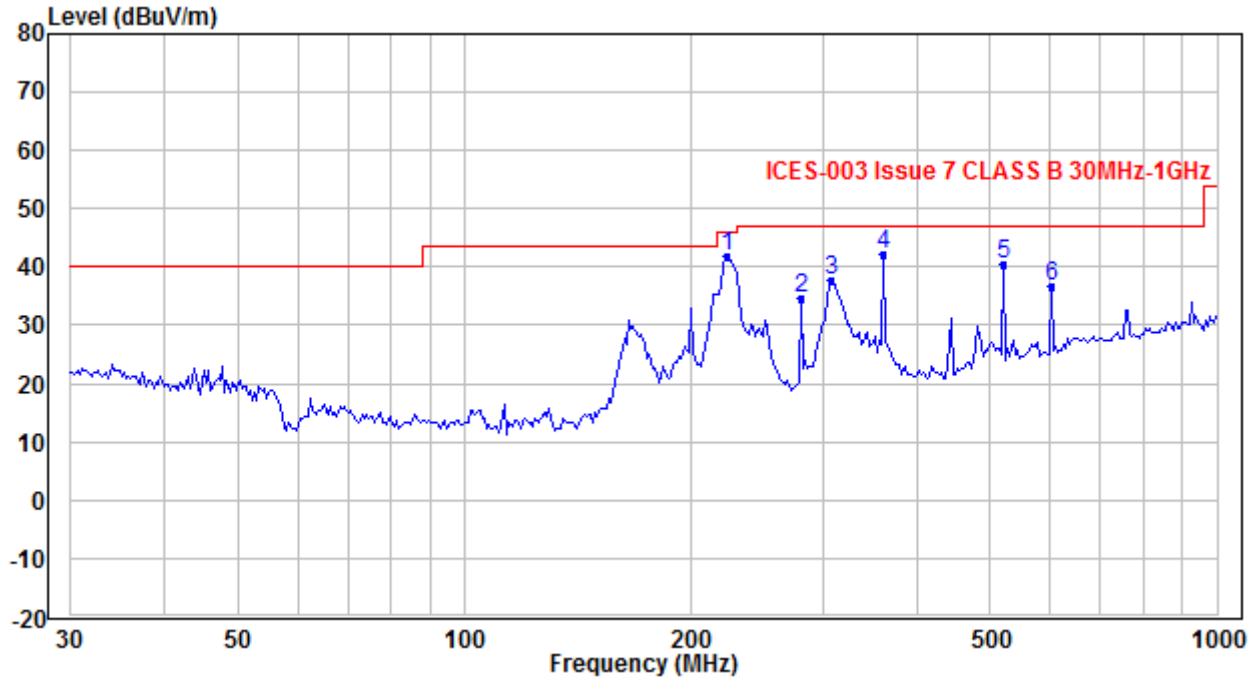
Vertical



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	38.096	37.76	-6.86	30.90	40.00	-9.10	QP
2	170.189	46.37	-11.39	34.98	43.50	-8.52	QP
3	200.043	42.00	-10.99	31.01	43.50	-12.49	QP
4	223.848	47.68	-10.70	36.98	46.00	-9.02	QP
5	360.977	39.01	-5.26	33.75	46.00	-12.25	QP
6	520.208	38.74	-2.63	36.11	46.00	-9.89	QP

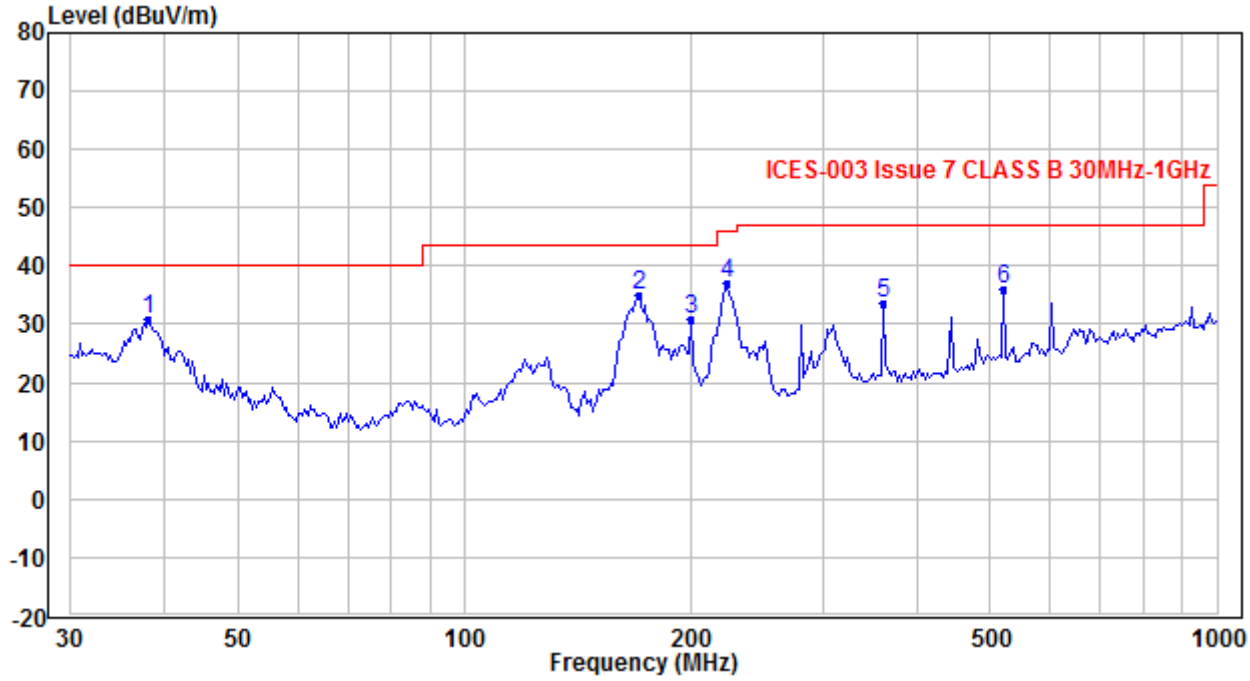
The measurement data for ICES-003 Issue 7 as follows:

Below 1GHz(Quasi Peak):
Mode1
Horizontal



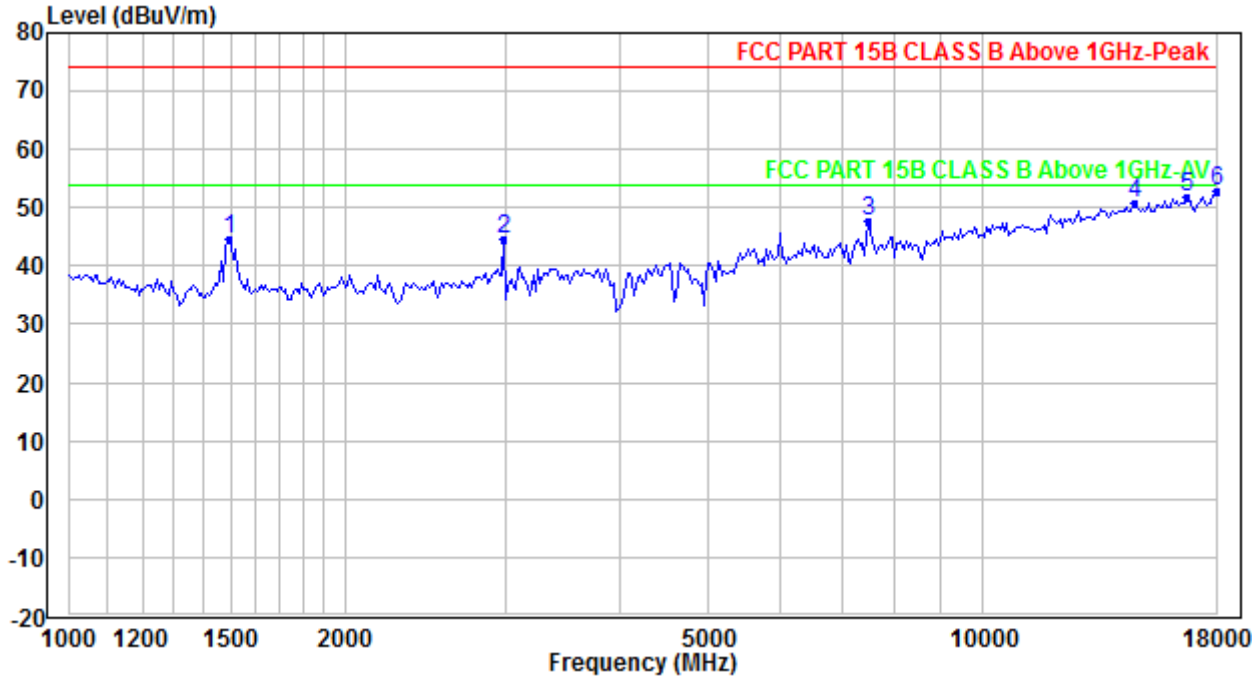
No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	223.848	52.60	-10.70	41.90	46.00	-4.10	QP
2	280.294	42.08	-7.50	34.58	47.00	-12.42	QP
3	307.105	44.12	-6.33	37.79	47.00	-9.21	QP
4	360.977	47.63	-5.26	42.37	47.00	-4.63	QP
5	520.208	43.23	-2.63	40.60	47.00	-6.40	QP
6	602.929	37.44	-0.82	36.62	47.00	-10.38	QP

Vertical



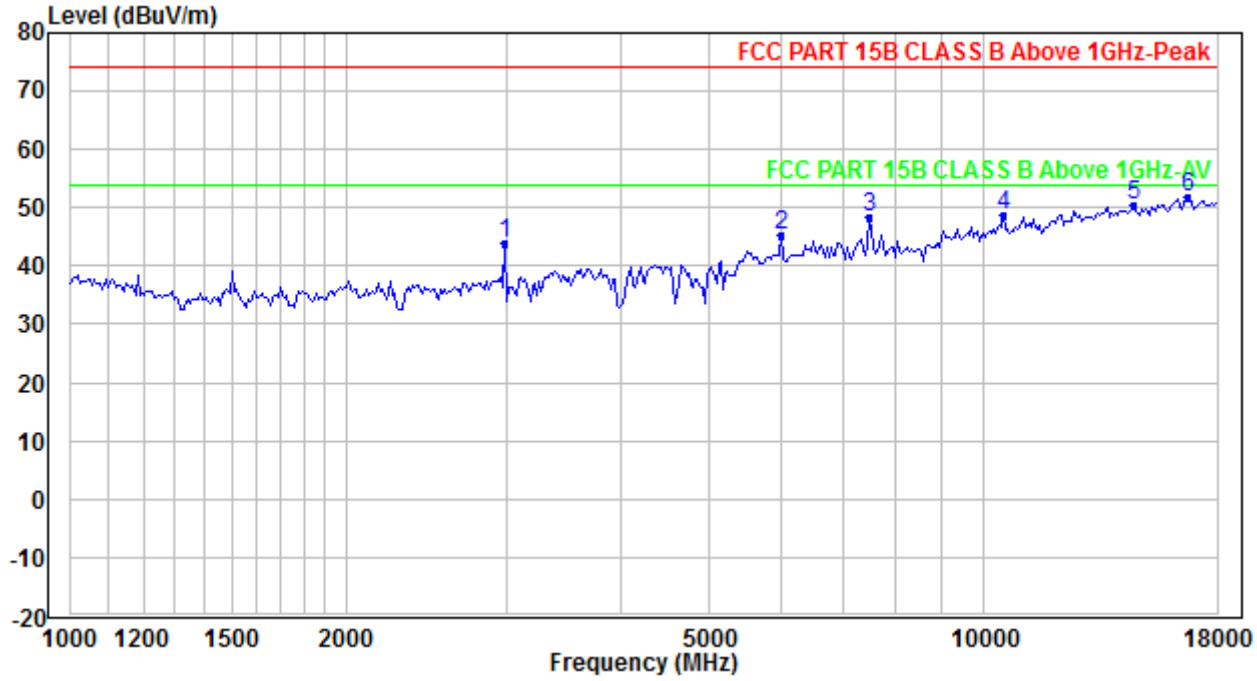
No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	38.096	37.76	-6.86	30.90	40.00	-9.10	QP
2	170.189	46.37	-11.39	34.98	43.50	-8.52	QP
3	200.043	42.00	-10.99	31.01	43.50	-12.49	QP
4	223.848	47.68	-10.70	36.98	46.00	-9.02	QP
5	360.977	39.01	-5.26	33.75	47.00	-13.25	QP
6	520.208	38.74	-2.63	36.11	47.00	-10.89	QP

Above 1GHz(Peak & Average)
Mode2
Horizontal



No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	1491.333	56.81	-12.09	44.72	74.00	-29.28	Peak
2	2988.436	51.21	-6.77	44.44	74.00	-29.56	Peak
3	7506.207	46.52	1.32	47.84	74.00	-26.16	Peak
4	14696.950	39.19	11.72	50.91	74.00	-23.09	Peak
5	16694.370	39.85	11.93	51.78	74.00	-22.22	Peak
6	18000.000	37.38	15.31	52.69	74.00	-21.31	Peak

Vertical



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	2988.436	51.35	-7.56	43.79	74.00	-30.21	Peak
2	5988.431	45.16	0.05	45.21	74.00	-28.79	Peak
3	7506.207	46.88	1.42	48.30	74.00	-25.70	Peak
4	10503.250	43.03	5.85	48.88	74.00	-25.12	Peak
5	14612.070	38.37	11.92	50.29	74.00	-23.71	Peak
6	16694.370	39.73	12.19	51.92	74.00	-22.08	Peak

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 two nominal voltages of 240V/50Hz and 120V/60Hz, 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.

6.2 CONDUCTED EMISSION

Test Requirement: FCC 47 CFR Part 15.107
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:

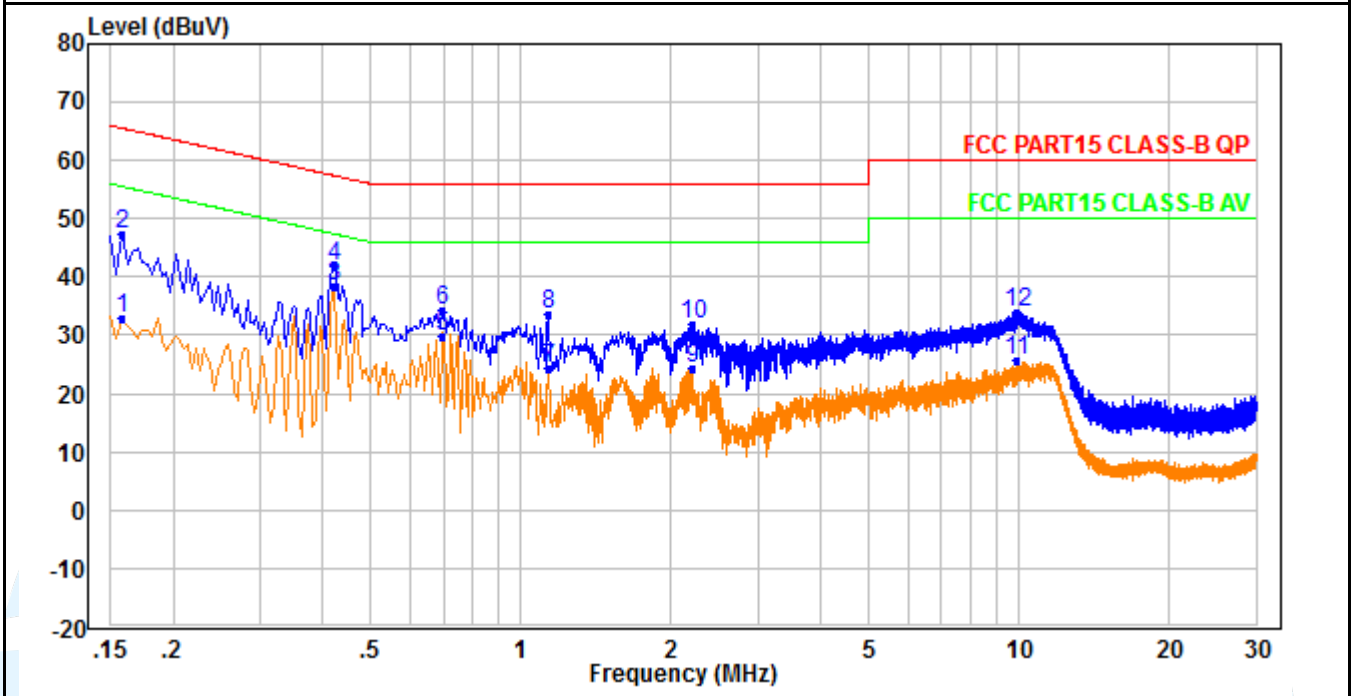
1) The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).
2) The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak 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

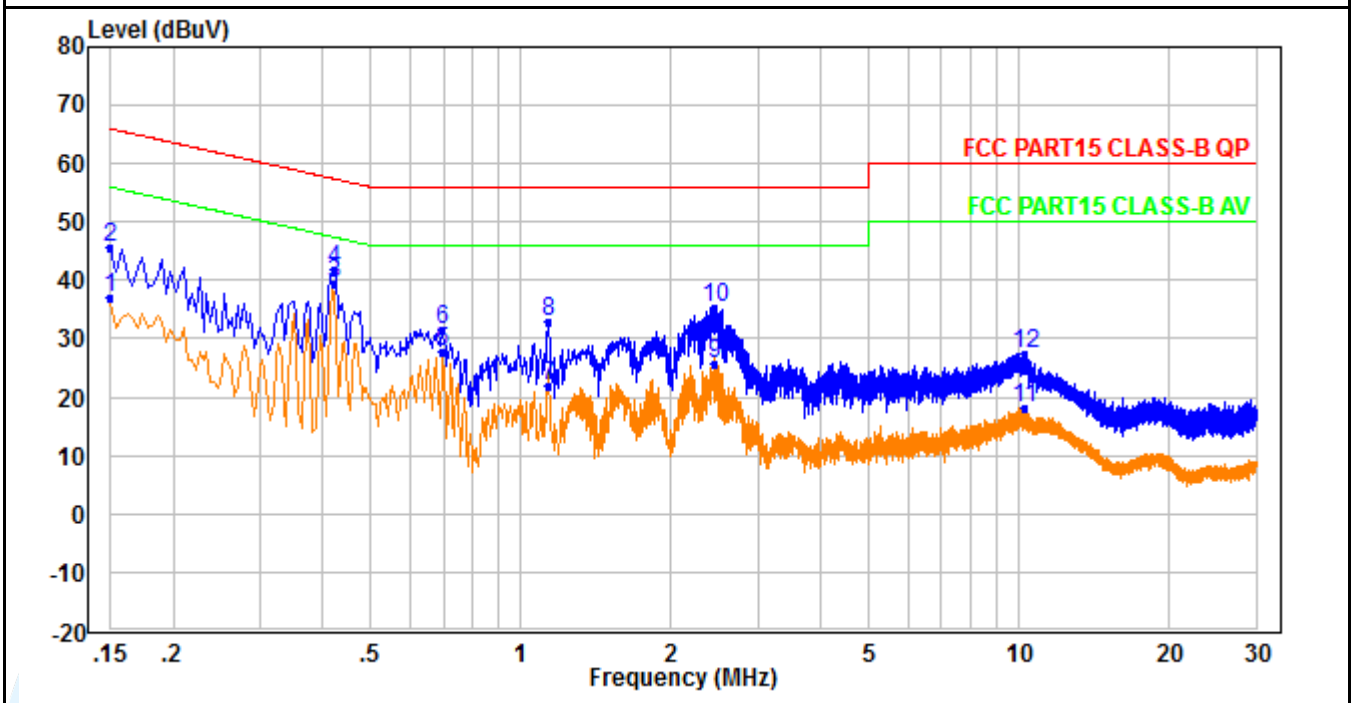
The measurement data as follows:
Quasi Peak and Average:
Mode 2

Live Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.158	23.33	9.75	33.08	55.57	-22.49	Average
2	0.158	37.53	9.75	47.28	65.57	-18.29	QP
3	0.422	28.66	9.80	38.46	47.41	-8.95	Average
4	0.422	32.17	9.80	41.97	57.41	-15.44	QP
5	0.698	19.91	9.85	29.76	46.00	-16.24	Average
6	0.698	24.49	9.85	34.34	56.00	-21.66	QP
7	1.134	14.58	9.89	24.47	46.00	-21.53	Average
8	1.134	23.67	9.89	33.56	56.00	-22.44	QP
9	2.214	14.45	9.89	24.34	46.00	-21.66	Average
10	2.214	22.15	9.89	32.04	56.00	-23.96	QP
11	9.885	15.43	10.24	25.67	50.00	-24.33	Average
12	9.885	23.84	10.24	34.08	60.00	-25.92	QP

Neutral Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.150	27.23	9.75	36.98	56.00	-19.02	Average
2	0.150	35.92	9.75	45.67	66.00	-20.33	QP
3	0.422	29.78	9.77	39.55	47.41	-7.86	Average
4	0.422	32.18	9.77	41.95	57.41	-15.46	QP
5	0.694	17.99	9.78	27.77	46.00	-18.23	Average
6	0.694	21.90	9.78	31.68	56.00	-24.32	QP
7	1.134	12.25	9.83	22.08	46.00	-23.92	Average
8	1.134	23.23	9.83	33.06	56.00	-22.94	QP
9	2.446	15.91	9.97	25.88	46.00	-20.12	Average
10	2.446	25.49	9.97	35.46	56.00	-20.54	QP
11	10.273	7.68	10.35	18.03	50.00	-31.97	Average
12	10.273	17.17	10.35	27.52	60.00	-32.48	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 possible modes of operation were investigated, and testing at two nominal voltages of 240V/50Hz and 120V/60Hz, only the worst case emissions reported.

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.