

FCC TEST REPORT

Product Name: RFID Handheld Scanner

Trade Mark:



Model No.: RFR900

Add. Model No.: N/A

Report Number: 2310127258EMC-1

Test Standards: FCC 47 CFR Part 15 Subpart B

FCC ID: SS4RFR971

Test Result: PASS

Date of Issue: November 1, 2024

Prepared for:

Bluebird Inc.

3F, 115, Irwon-ro, Gangnam-gu, Seoul, Republic of Korea

Prepared by:

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November 1, 2024

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Version

Version No.	Date	Description
V1.0	November 1, 2024	Original



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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Bluebird Inc.
Address of Applicant:	3F, 115, Irwon-ro, Gangnam-gu, Seoul, Republic of Korea
Manufacturer:	Bluebird Inc.
Address of Manufacturer:	3F, 115, Irwon-ro, Gangnam-gu, Seoul, Republic of Korea
Factory 1:	Bluebird Inc.
Address of Factory 1:	SSang-young IT Twin tower-B 7~8F), 531, Dunchon-daero, Jungwon-gu, Seongnam-si, Gyeonggi-do, Korea
Factory 2:	DSGLOBAL VINA CO.,LTD
Address of Factory 2:	Lot XN3-1E, Dai An expansion Industrial Zone, Lai Cach town Cam Giang district, HaiDuong province, Vietnam

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	RFID Handheld Scanner
Model No.:	RFR900
Add. Model No.:	N/A
Trade Mark:	
DUT Stage:	Identical Prototype
Rated Voltage:	☒ Powered by USB port
	☒ Powered by Cradle
	☒ Adapter: Input: 100-240 V~50/60 Hz 0.5 A Output: 5 V $\Rightarrow$ 2.0 A
Classification of digital devices:	Class B
Highest Internal Frequency:	2.48 GHz
Software Version:	RFR900-20230920 (Provided by the customer)
Hardware Version:	Rev 2.1 (Provided by the customer)
Sample Received Date:	October 12, 2022
Sample Tested Date:	January 26, 2024 to April 18, 2024
Remark: The above EUT's information was provided by customer. Please refer to the specifications or user's manual for more detailed description.	

1.2.2 Description of Accessories

Adapter	
Model No.:	KSA29B0500200D5
Input:	100-240 V~50/60 Hz 0.5A
Output:	5.0 V $\equiv$ 2.0A
AC Cable:	N/A
DC Cable:	N/A

Battery	
Model No.:	BAT-RFR900_S
Battery Type:	Rechargeable Li-ion Battery Pack
Rated Voltage:	3.6 Vdc
Limited Charge Voltage:	4.2 Vdc
Rated Capacity:	3400 mAh

Cable	
Description:	MicroUSB Plug Cable
Connector:	USB Type-A to MicroUSB
Cable Type:	Shielded without ferrite
Length:	1 Meter

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
Cradle	BLUEBIRD	SHARECRD-1S06	CRD-HF550X-RFR 90-1SC-T1	BLUEBIRD
Cradle	BLUEBIRD	SHARECRD-1S06	204010074EWHK QNL	BLUEBIRD
AC ADAPTER	CHANNEL WELL TECHNOLOGY	KPL-060F-VI	11-23070001-5647 5	BLUEBIRD
Hybrid Full-Touch Handheld Computer	BLUEBIRD	HF550X	HF550XANLCBZ876	BLUEBIRD
RFID Tags	N/A	AZ-H93	N/A	BLUEBIRD

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
N/A	N/A	N/A	N/A	N/A

1.4 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

Telephone: +86 (0) 755 2823 0888

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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.

ISED Wireless Device Testing Laboratories

CAB identifier: CN0032

FCC Accredited Lab.

Designation Number: CN1194

Test Firm Registration Number: 259480

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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-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	ANSI C63.4-2014	PASS
Radiated Emission	FCC 47 CFR Part 15.109	ANSI C63.4-2014	PASS



3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
☒	3m SAC	ETS-LINDGREN	3M	Euroshiedpn-CT001270-1317	11-Nov-2023	10-Nov-2026
☒	Receiver	R&S	ESIB26	100114	27-Oct-2023	26-Oct-2024
☐	Loop Antenna	ETS-LINDGREN	6502	00202525	30-Oct-2023	29-Oct-2024
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	30-Oct-2023	29-Oct-2024
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	30-Oct-2023	29-Oct-2024
☒	Preamplifier	HP	8447F	2805A02960	31-Oct-2023	30-Oct-2024
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201541	16-Apr-2023	15-Apr-2024
					01-Apr-2024	31-Mar-2025
☒	Pre-amplifier	ETS-LINDGREN	00118385	00201874	31-Oct-2023	30-Oct-2024
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	30-Oct-2023	29-Oct-2024
☒	Pre-amplifier	ETS-LINDGREN	00118384	00202652	30-Oct-2023	29-Oct-2024
☒	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	Cal. Due date
☒	Receiver	R&S	ESR7	101181	27-Oct-2023	26-Oct-2024
☒	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	27-Oct-2023	26-Oct-2024
☒	LISN	R&S	ESH2-Z5	860014/024	27-Oct-2023	26-Oct-2024
☐	LISN	ETS-Lindgren	3816/2SH	00201088	27-Oct-2023	26-Oct-2024
☒	Test Software	EZ-EMC	EZ-CON	Software Version: EMC-CON 3A1.1		

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	Relative Humidity (%)
NT/NV	+15 to +35	1. 3.6Vdc and/or 120V~60Hz 2. 3.6Vdc and/or 240V~50Hz	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment and Test Sample

Test Item	Temp. (°C)	Relative Humidity (%)	Pressure (kPa)	Sample No.	Tested by
Radiated Emission	24.2	55.8	100.0	S202309252169-ZJC10/10 S202404163174-ZJE01/1	Yana Zeng
Conducted Emission	18.3	43.3	100.5	S202309252169-ZJC10/10	Linson Xie

4.2 TEST MODES

Test Item	EMI Test Modes
Radiated Emission	Test Mode 1: Charging from Adapter (with 120 Vac) + USB Cable + Power On
	Test Mode 2: Charging from Adapter (with 120 Vac) + USB Cable + Reading Tags (with HF550X)
	Test Mode 3: Charging from Adapter (with 120 Vac) + USB Cable + Scanning Barcodes (with HF550X)
	Test Mode 4: Charging from Adapter (with 240 Vac) + USB Cable + <u>Worst from test mode 1~3</u>
	Test Mode 5: Charging from <u>Cradle</u> (with 120 Vac) + Charge with the HF550X
	Test Mode 6: Charging from <u>Cradle</u> (with 120 Vac) + Only RFR900
	Test Mode 7: Charging from <u>Cradle</u> (with 240 Vac) + <u>Worst from test mode 5~6</u>
	Test Mode 8: Scanning Barcodes (with HF550X)
	Test Mode 9: Reading Tags (with HF550X)
Conducted Emission	Test Mode 1: Charging from Adapter (with 120 Vac) + USB Cable + Power On
	Test Mode 2: Charging from Adapter (with 120 Vac) + USB Cable + Reading Tags (with HF550X)
	Test Mode 3: Charging from Adapter (with 120 Vac) + USB Cable + Scanning Barcodes (with HF550X)
	Test Mode 4: Charging from Adapter (with 240 Vac) + USB Cable + <u>Worst from test mode 1~3</u>
	Test Mode 5: Charging from <u>Cradle</u> (with 120 Vac) + Charge with the HF550X
	Test Mode 6: Charging from <u>Cradle</u> (with 120 Vac) + Only RFR900
	Test Mode 7: Charging from <u>Cradle</u> (with 240 Vac) + <u>Worst from test mode 5~6</u>

4.3 TEST SETUP

4.3.1 For Radiated Emissions test setup

Figure 1. 30MHz to 1GHz

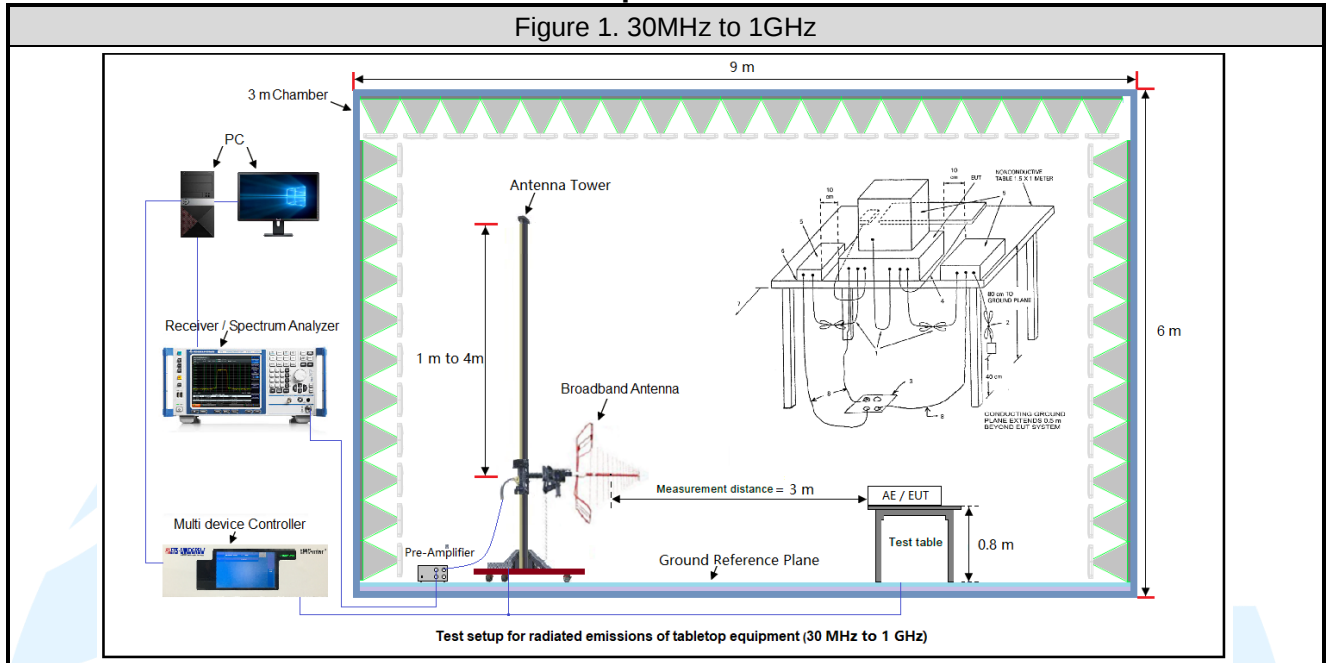
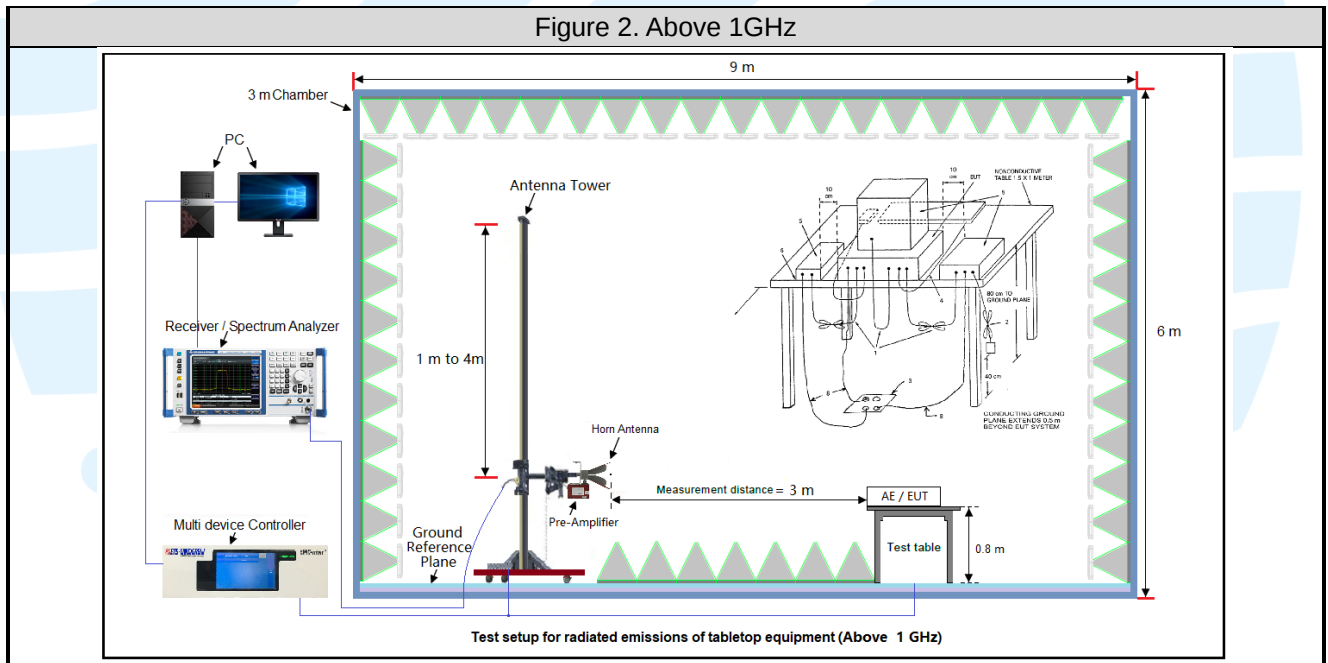
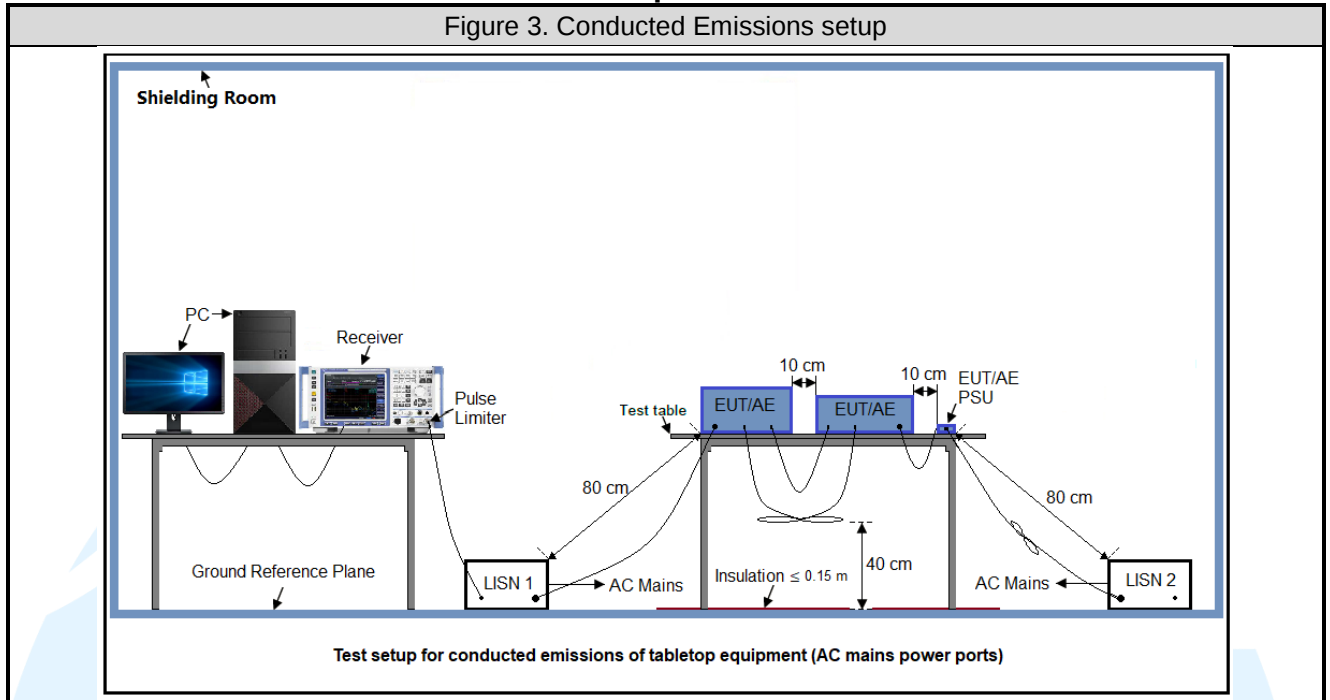


Figure 2. Above 1GHz



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	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
3	KDB 174176 D01 Line Conducted FAQ v01r01	AC power-line conducted emission frequency asked questions
4	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: ANSI C63.4-2014

Receiver Setup:

Frequency: (f) (MHz)	Detector type	Measurement receiver bandwidth	
		RBW	VBW
$30 \leq f \leq 1\,000$	Quasi Peak	120 kHz	300 kHz
$f \geq 1000$	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

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 to 1000	54.0	--	--
Above 1000	--	74.0	54.0

Remark:

- The lower limit shall apply at the transition frequencies.
- Emission level (dB μ V/m) = 20 log Emission level (μ V/m).
- 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:

- From 30 MHz to 1GHz test procedure as below:

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- 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.

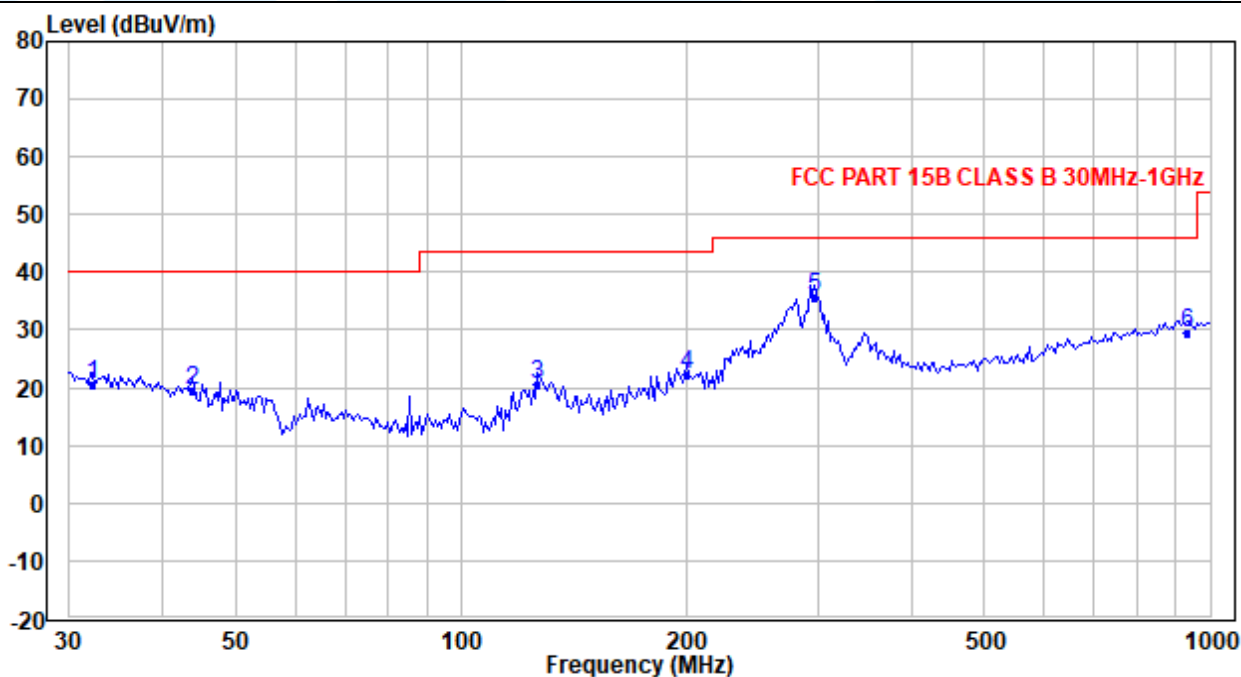
Test Result: Pass

The measurement data as follows:

Below 1GHz(Quasi Peak):

Test Mode 7

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	32.184	25.79	-5.17	20.62	40.00	-19.38	QP
2	43.845	30.17	-10.54	19.63	40.00	-20.37	QP
3	126.693	36.37	-15.75	20.62	43.50	-22.88	QP
4	200.043	32.57	-10.39	22.18	43.50	-21.32	QP
5	296.502	42.86	-7.06	35.80	46.00	-10.20	QP
6	932.141	24.57	4.93	29.50	46.00	-16.50	QP

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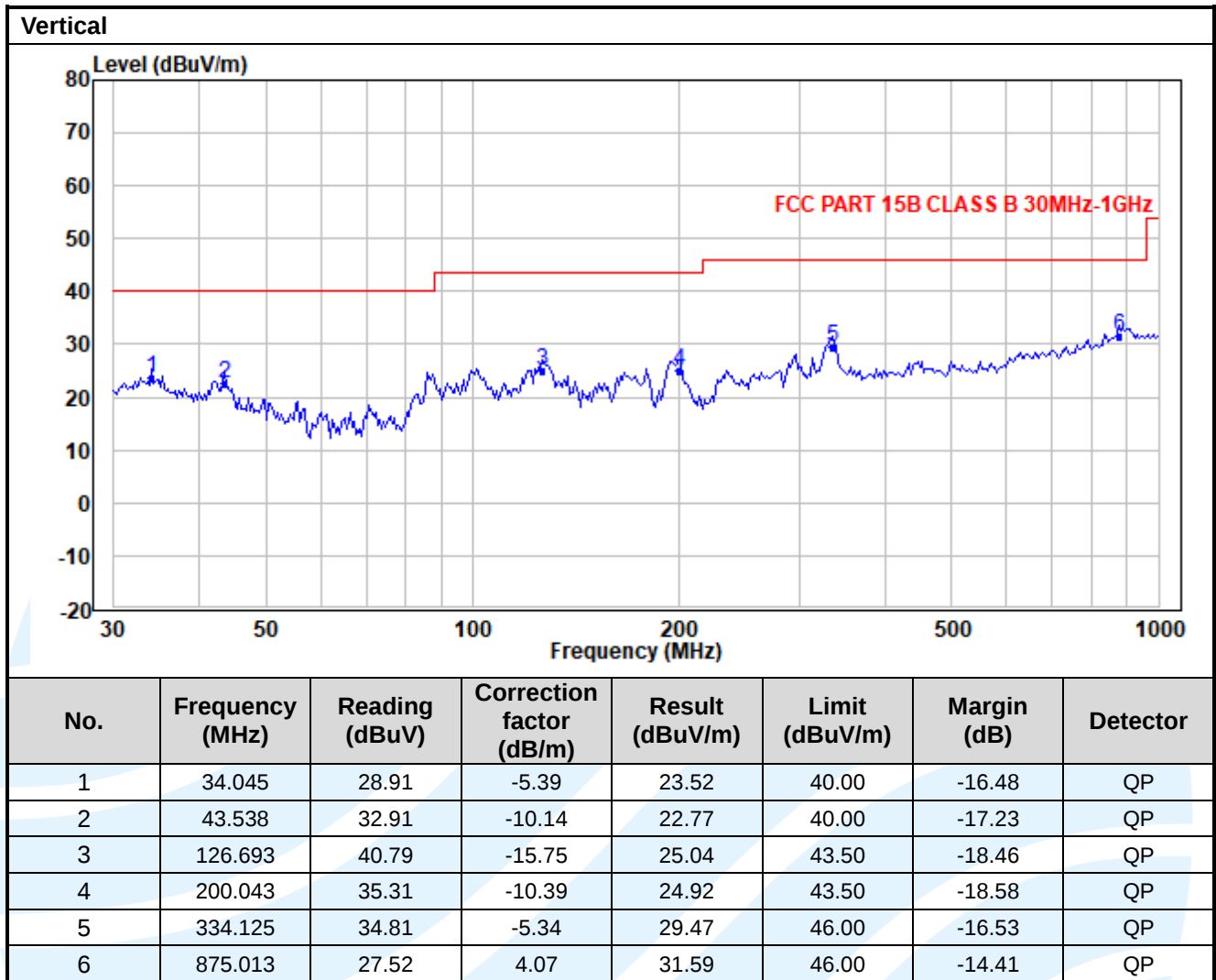
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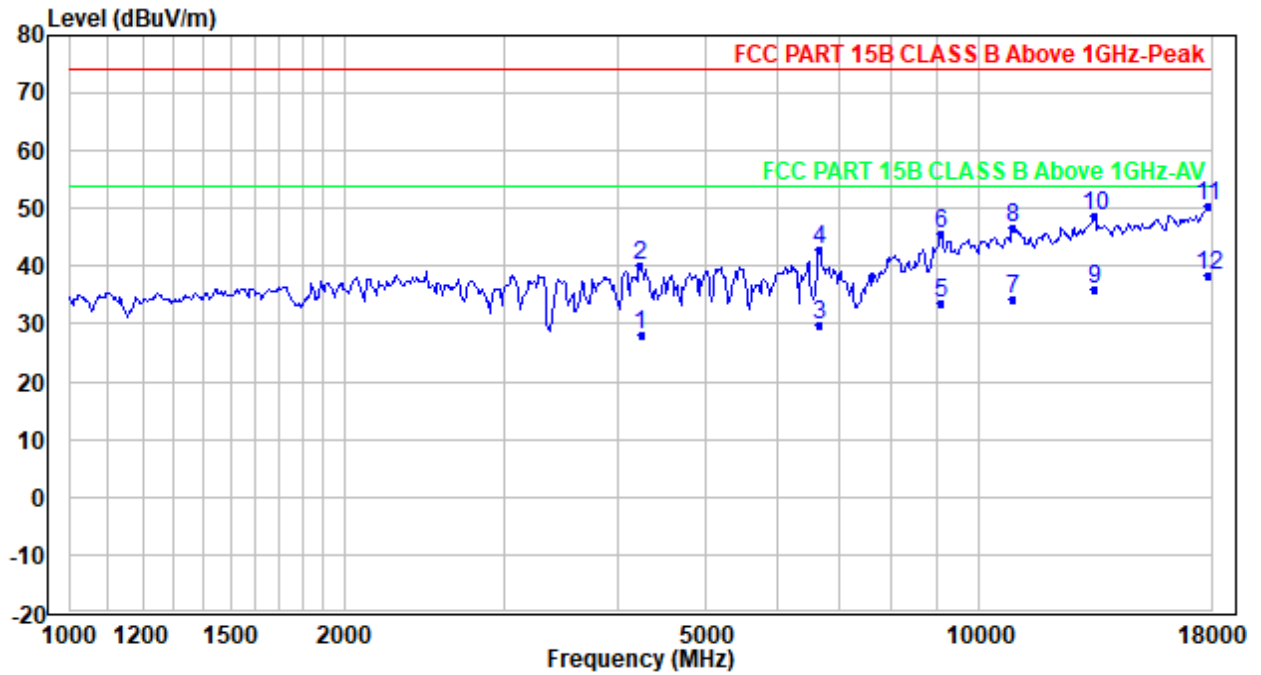
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Above 1GHz(Peak & Average)
Test Mode 1
Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	4242.641	31.09	-2.89	28.20	54.00	-25.80	Average
2	4242.641	43.19	-2.89	40.30	74.00	-33.70	Peak
3	6665.783	28.85	0.95	29.80	54.00	-24.20	Average
4	6665.783	41.85	0.95	42.80	74.00	-31.20	Peak
5	9087.293	28.40	5.11	33.51	54.00	-20.49	Average
6	9087.293	40.41	5.11	45.52	74.00	-28.48	Peak
7	10906.240	27.03	7.29	34.32	54.00	-19.68	Average
8	10906.240	39.40	7.29	46.69	74.00	-27.31	Peak
9	13396.090	24.48	11.70	36.18	54.00	-17.82	Average
10	13396.090	36.86	11.70	48.56	74.00	-25.44	Peak
11	17844.290	23.50	14.87	38.37	54.00	-15.63	Average
12	17844.290	35.60	14.87	50.47	74.00	-23.53	Peak

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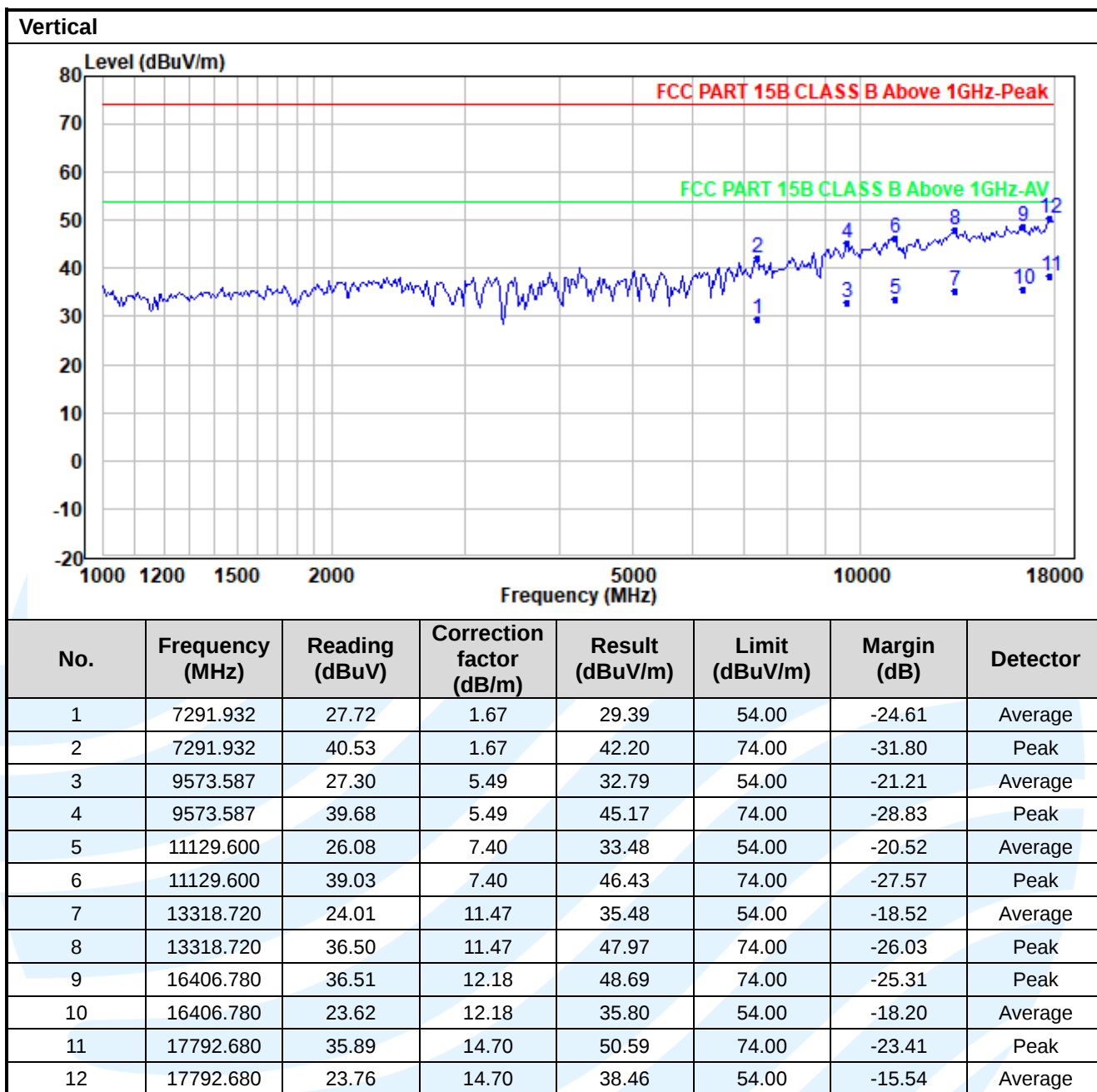
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Remark:

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.

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6.2 CONDUCTED EMISSION

Test Requirement: FCC 47 CFR Part 15.107

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.

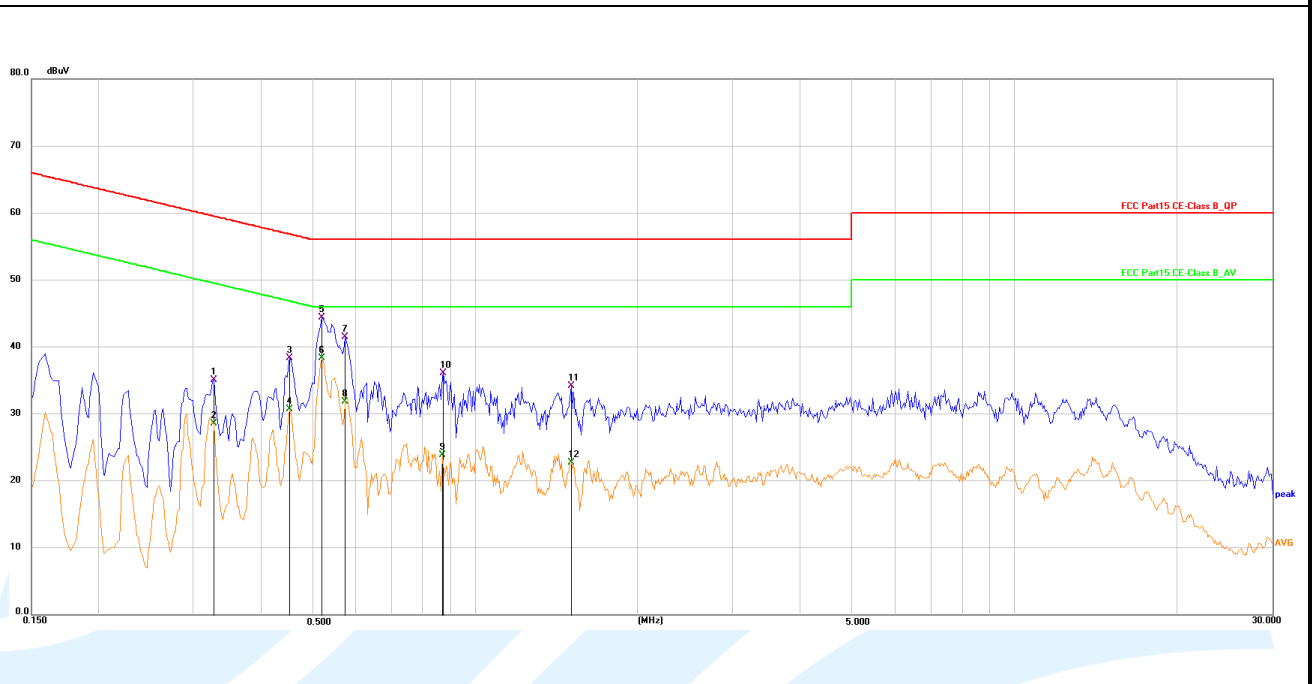
Test Result: Pass

The measurement data as follows:

Quasi Peak and Average:

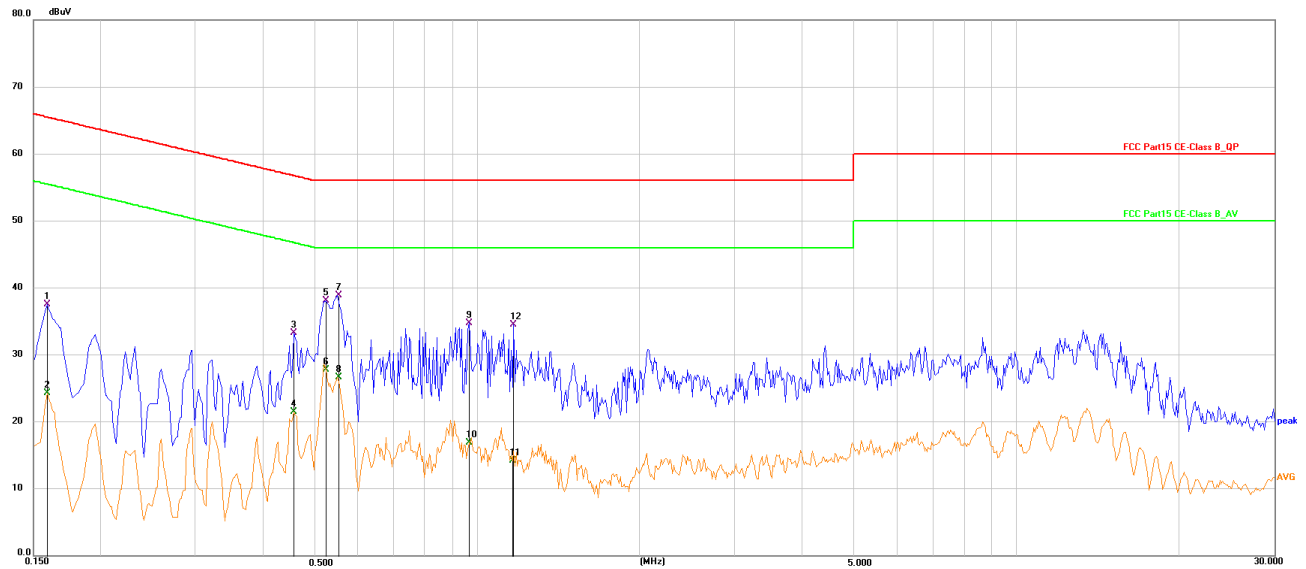
Test Mode 3

Live Line



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.3255	24.82	10.19	35.01	59.57	-24.56	QP
2	0.3255	18.33	10.19	28.52	49.57	-21.05	AVG
3	0.4515	28.19	10.16	38.35	56.85	-18.50	QP
4	0.4515	20.52	10.16	30.68	46.85	-16.17	AVG
5	0.5190	34.18	10.19	44.37	56.00	-11.63	QP
6	0.5190	28.08	10.19	38.27	46.00	-7.73	AVG
7	0.5730	31.31	10.20	41.51	56.00	-14.49	QP
8	0.5730	21.59	10.20	31.79	46.00	-14.21	AVG
9	0.8700	13.57	10.29	23.86	46.00	-22.14	AVG
10	0.8745	25.76	10.28	36.04	56.00	-19.96	QP
11	1.5090	23.86	10.29	34.15	56.00	-21.85	QP
12	1.5090	12.44	10.29	22.73	46.00	-23.27	AVG

Neutral Line



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1590	27.41	10.17	37.58	65.52	-27.94	QP
2	0.1590	14.09	10.17	24.26	55.52	-31.26	AVG
3	0.4560	23.09	10.23	33.32	56.77	-23.45	QP
4	0.4560	11.29	10.23	21.52	46.77	-25.25	AVG
5	0.5234	27.79	10.27	38.06	56.00	-17.94	QP
6	0.5234	17.48	10.27	27.75	46.00	-18.25	AVG
7	0.5503	28.65	10.27	38.92	56.00	-17.08	QP
8	0.5503	16.43	10.27	26.70	46.00	-19.30	AVG
9	0.9645	24.61	10.17	34.78	56.00	-21.22	QP
10	0.9645	6.71	10.17	16.88	46.00	-29.12	AVG
11	1.1625	3.98	10.19	14.17	46.00	-31.83	AVG
12	1.1670	24.29	10.19	34.48	56.00	-21.52	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.

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UTTR-EMC-FCCPART15B-V1.1

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.
