FCC & ISED TEST REPORT

Product Name:	IP Phone
Trade Mark:	GRANDSTREAM
Model No:	GRP2616
HVIN:	GRP2616V2
Report Number:	200829026EMC-1
Test Standards:	FCC 47 CFR Part 15 Subpart B ICES-003 Issue 6
FCC ID:	YZZGRP2616V2
IC:	11964A-GRP2616V2
Test Result:	PASS
Date of Issue:	November 16, 2020

Prepared for:

Grandstream Networks,Inc.
126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.
16/F, Block A, Building 6, Baoneng Science and Technology Park,
Qingxiang Road No.1, Longhua New District, Shenzhen, China
TEL: +86-755-2823 0888
FAX: +86-755-2823 0886

Prepared by: Henry Lu, Team Leader

Reviewed by: Kevin Liang, Assistant Manager

Approved by: Billy Li, Technical Director

Date: November 16, 2020

Version

Version No.	Date	Description
V1.0	November 16, 2020	Original

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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Grandstream Networks,Inc.
Address of Applicant:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA
Manufacturer:	Grandstream Networks,Inc.
Address of Manufacturer:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	IP Phone
Model No:	GRP2616
HVIN:	GRP2616V2
Trade Mark:	GRANDSTREAM
DUT Stage:	Production Unit
Rated Voltage:	☒ 100-240V~50/60Hz
	☒ Powered by POE port
Classification of digital devices:	Class B
Highest Internal Frequency:	5825 MHz
Sample Received Date:	September 3, 2020
Sample Tested Date:	September 8, 2020 to September 10, 2020

1.2.2 Description of Accessories

Adapter(1)	
Model No.:	GQ12-120100-AU
Input:	100-240 V~50/60 Hz 0.4A Max
Output:	12.0 V ⎓ 1.0 A
DC Cable:	2.5 Meter, Unshielded without ferrite

Adapter(2)	
Model No.:	DSA-12PFU-12 FUS 102100
Input:	100-240 V~50/60 Hz 0.5A
Output:	12.0 V ⎓ 1.0 A
DC Cable:	2.5 Meter, Unshielded without ferrite

Adapter(3)	
Model No.:	F12US1200100A
Input:	100-240 V~50/60 Hz 0.5A Max
Output:	12.0 V ⎓ 1.0 A
DC Cable:	2.5 Meter, Unshielded without ferrite

Cable(1)	
Connector:	Ethernet Cable
Cable Type:	Unshielded without ferrite
Length:	1.5 Meter

Cable(2)	
Connector:	Phone Cord
Cable Type:	Unshielded without ferrite
Length:	3.5 Meter

Others
1x Handset, 1x Phone Stand

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	B40-80	MP12NEQ6	UnionTrust
USB disk	Kingston	DTSE9	N/A	UnionTrust
Mouse	DELL	MS111	CN-011D3V-738	UnionTrust
Headset	YEY	VE120-MV	N/A	UnionTrust
Standard POE Power supply	TP-LINK	TL-POE160S	N/A	UnionTrust
IP Phone	GRANDSTREAM	GRP2615	N/A	Applicant

2) Support Cable

Cable No.	Description	Connector	Length	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 Unshielded without ferrite	UnionTrust

1.4 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China 518109
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 6 Section 6.1	ANSI C63.4-2014	PASS
Radiated Emission	FCC 47 CFR Part 15.109 ICES-003 Issue 6 Section 6.2	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	Dec. 03, 2018	Dec. 03, 2021
☒	Receiver	R&S	ESIB26	100114	Nov. 24, 2019	Nov. 23, 2020
☒	Loop Antenna	ETS-LINDGREN	6502	00202525	Nov. 16, 2019	Nov. 15, 2020
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Nov. 16, 2019	Nov. 15, 2020
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	Nov. 16, 2019	Nov. 15, 2020
☒	Preamplifier	HP	8447F	2805A02960	Nov. 24, 2019	Nov. 23, 2020
☐	Broadband Antenna (Pre-amplifier)	ETS-LINDGREN	3142E-PA	00201891	Nov. 24, 2019	Nov. 23, 2020
☐	6dB Attenuator	Talent	RA6A5-N-18	18103002	Nov. 24, 2019	Nov. 23, 2020
☐	Horn Antenna	ETS-LINDGREN	3117	00164202	Nov. 16, 2019	Nov. 15, 2020
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	May. 30, 2020	May. 29, 2021
☐	Horn Antenna	ETS-LINDGREN	3116C	00200180	Jun. 19, 2020	Jun. 18, 2021
☐	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	Nov. 16, 2019	Nov. 15, 2020
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☐	Highpass Filter (1.2GHz~18GHz)	Micro-Tronics	HPM50108	G552	Nov. 24, 2019	Nov. 23, 2020
☐	Highpass Filter (3GHz~18GHz)	Micro-Tronics	HPM50117	G005	Nov. 24, 2019	Nov. 23, 2020
☒	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. 24, 2019	Nov. 23, 2020
☒	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	Nov. 24, 2019	Nov. 23, 2020
☒	LISN	R&S	ESH2-Z5	860014/024	Nov. 24, 2019	Nov. 23, 2020
☒	LISN	ETS-Lindgren	3816/2SH	00201088	Nov. 24, 2019	Nov. 23, 2020
☒	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	Powered by POE Port or Powered by DC 12V/1.0A	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	24.7	48	99.96	Tripp Jiang
Radiated Emission	25.2	52	100.02	Andy Lin

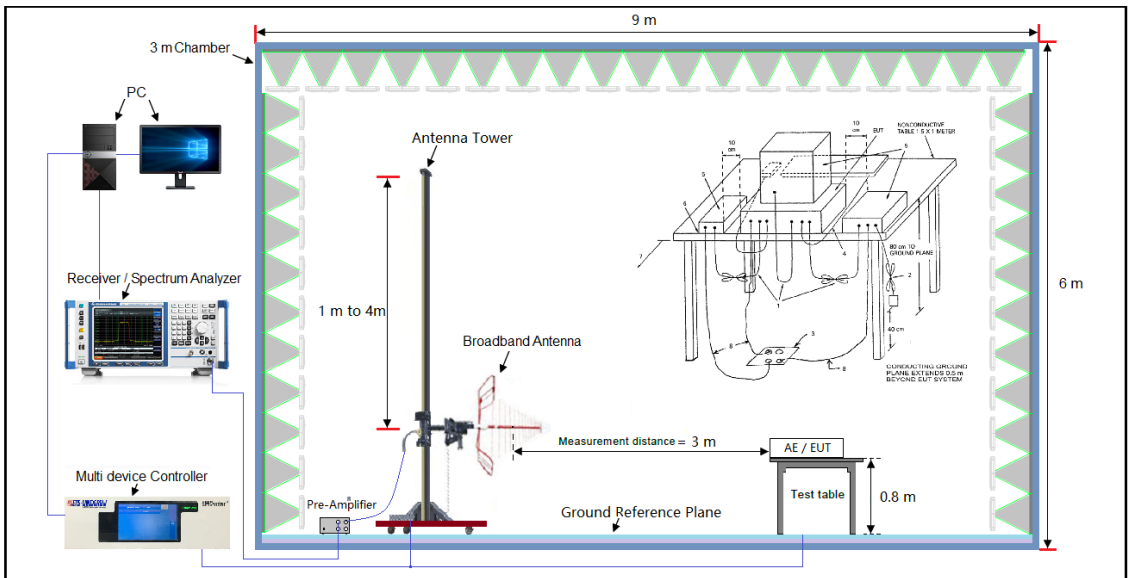
4.2 TEST MODES

Test Item	EMI Test Modes
Radiated Emission	TM1: AC120V/60Hz (Adaptor1) + Hands Free TM2: AC120V/60Hz (Adaptor1) + Ringing **TM3: AC120V/60Hz (Adaptor1) + Handset** TM4: AC120V/60Hz (Adaptor1) + Headset **TM5: AC240V/50Hz (Adaptor1) + Worse from mode 1~4** TM6: Worse from mode 1~5 (Adaptor2) TM7: Worse from mode 1~5 (Adaptor3) TM8: AC120V/60Hz (POE) +Worse from mode 1~4
Conducted Emission	TM1: AC120V/60Hz (Adaptor1) + Hands Free TM2: AC120V/60Hz (Adaptor1) + Ringing TM3: AC120V/60Hz (Adaptor1) + Handset TM4: AC120V/60Hz (Adaptor1) + Headset TM5: AC240V/50Hz (Adaptor1) + Worse from mode 1~4 TM6: Worse from mode 1~5 (Adaptor2) TM7: Worse from mode 1~5 (Adaptor3) **TM8: AC120V/60Hz (POE) +Worse from mode 1~4**
Remark: The above test modes in boldface were the worst cases, only the test data of these modes were reported.	

4.3 TEST SETUP

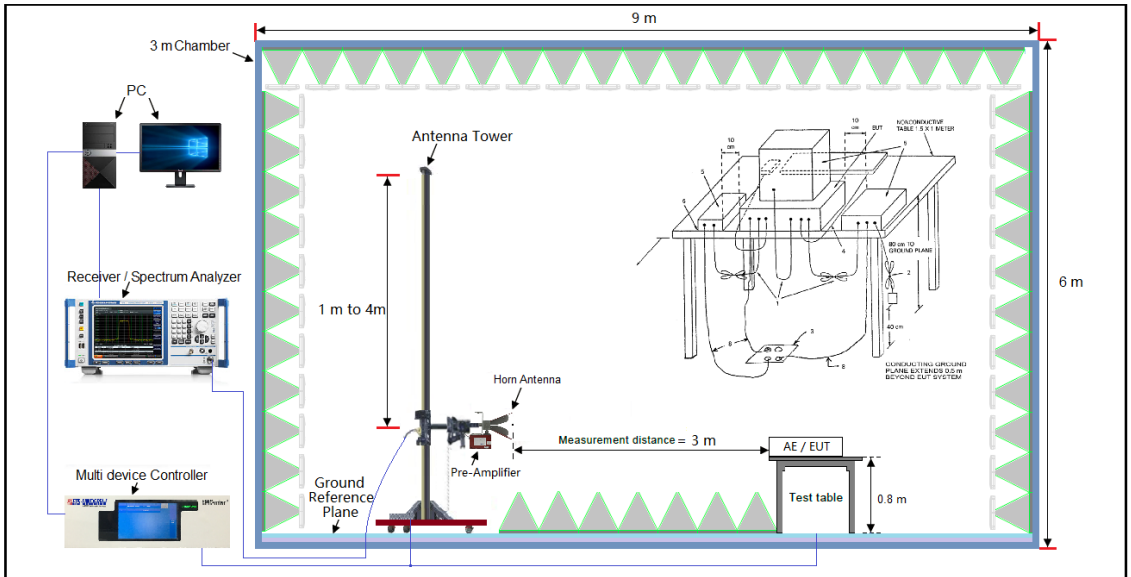
4.3.1 For Radiated Emissions test setup

Figure 1. 30MHz to 1GHz



Test setup for radiated emissions of tabletop equipment (30 MHz to 1 GHz)

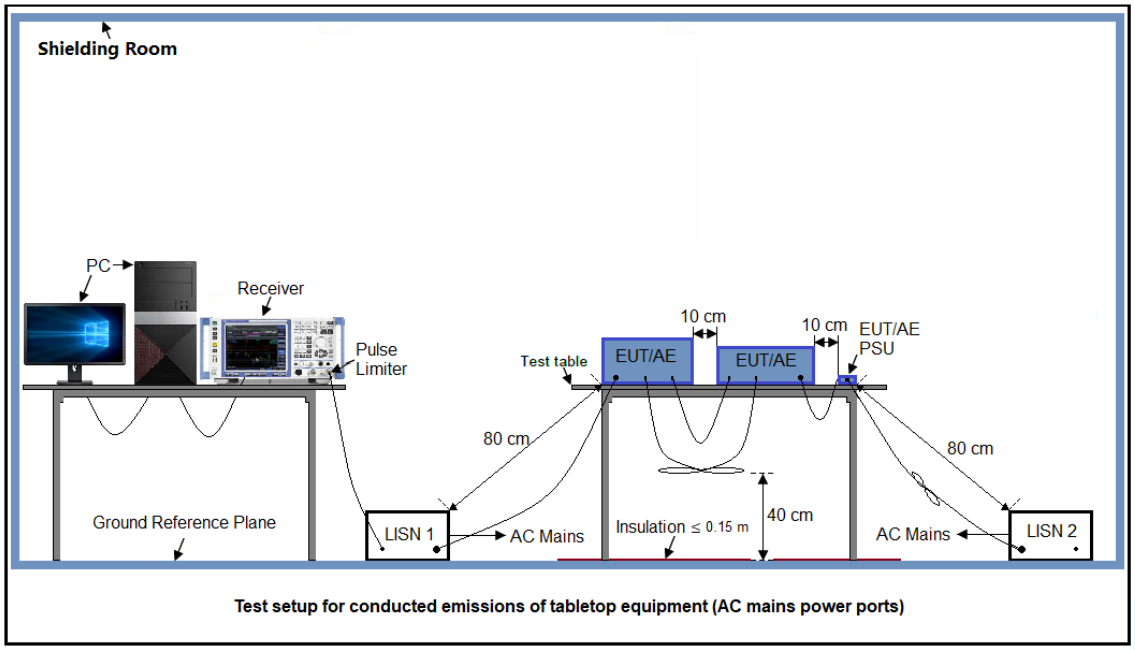
Figure 2. Above 1GHz



Test setup for radiated emissions of tabletop equipment (Above 1 GHz)

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 6	Information Technology Equipment (Including Digital Apparatus) —Limits and Methods of Measurement
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 6 Clause 6.2

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

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 to 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:

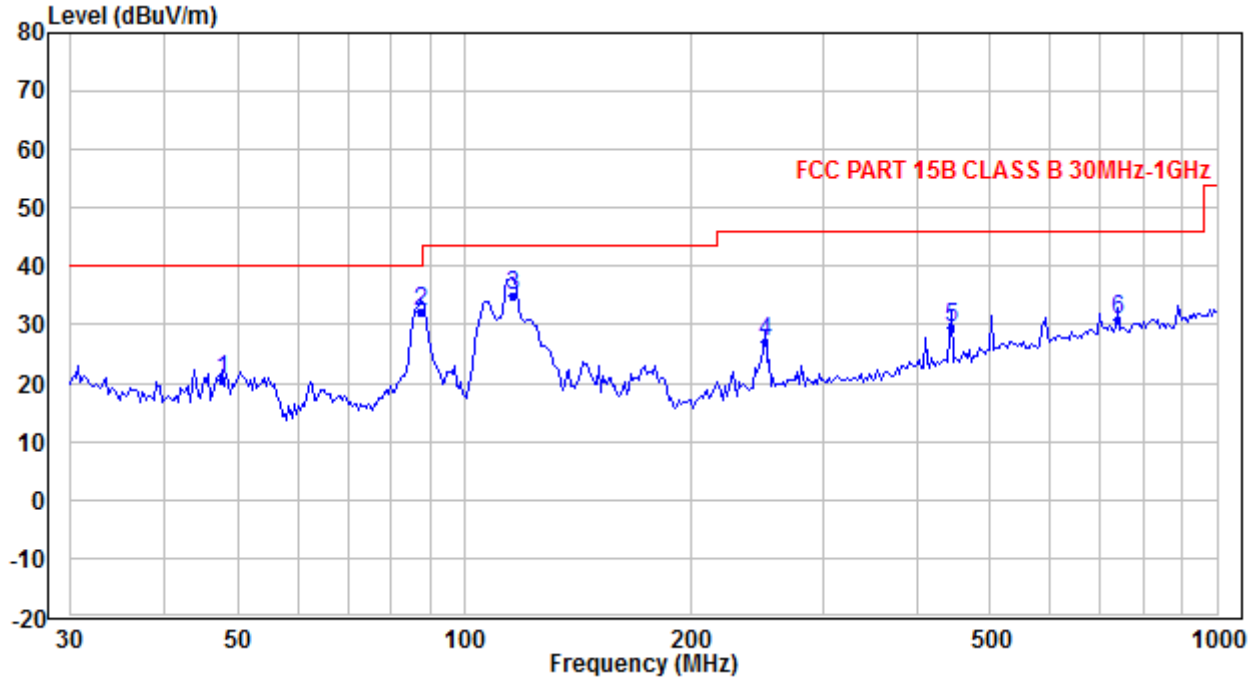
1) The Product was placed on the non-conductive turntable 0.8 m above the ground at a chamber.
2) Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal 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

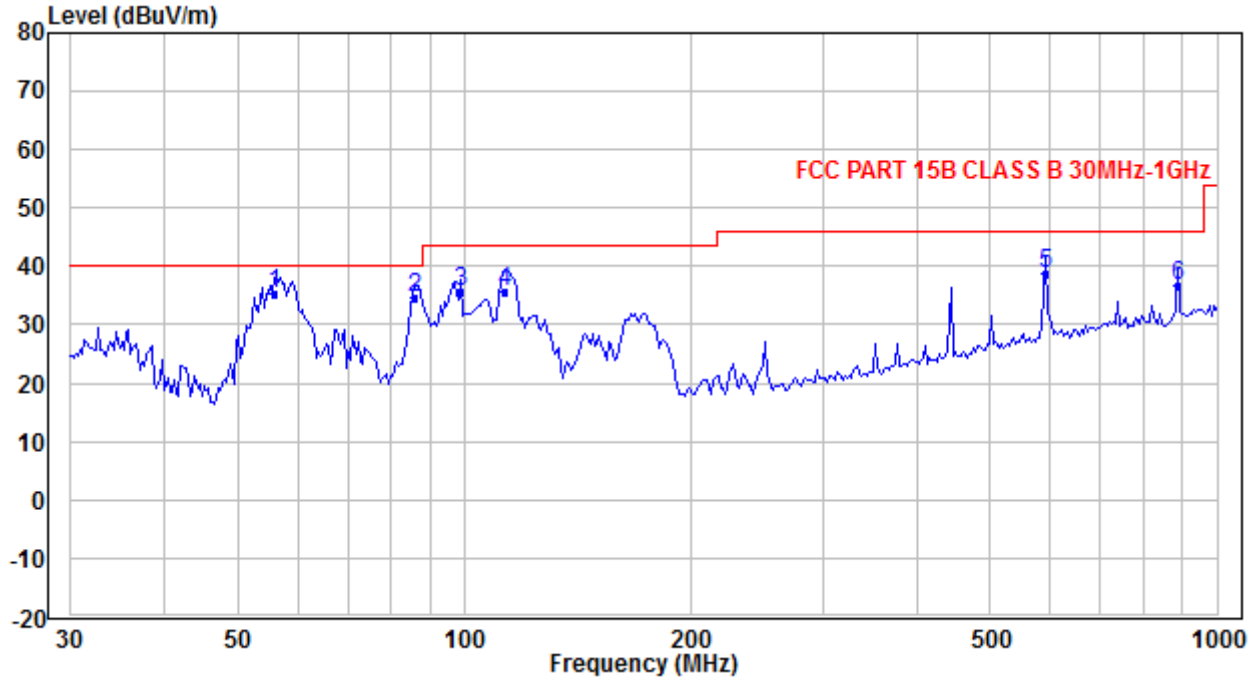
The measurement data as follows:

Below 1GHz(Quasi Peak):
Mode3
Horizontal



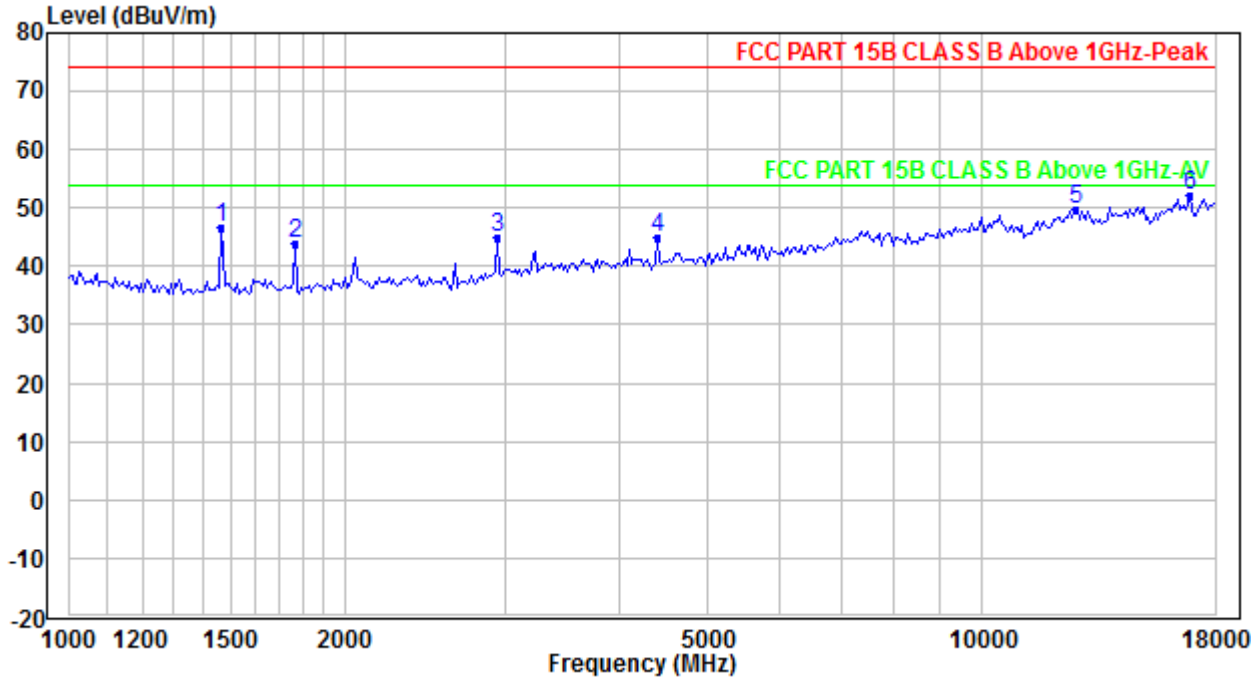
No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	47.703	34.86	-14.44	20.42	40.00	-19.58	QP
2	87.298	46.00	-13.84	32.16	40.00	-7.84	QP
3	115.632	47.61	-12.65	34.96	43.50	-8.54	QP
4	250.486	33.86	-6.73	27.13	46.00	-18.87	QP
5	442.572	32.01	-2.49	29.52	46.00	-16.48	QP
6	739.214	28.02	3.01	31.03	46.00	-14.97	QP

Vertical



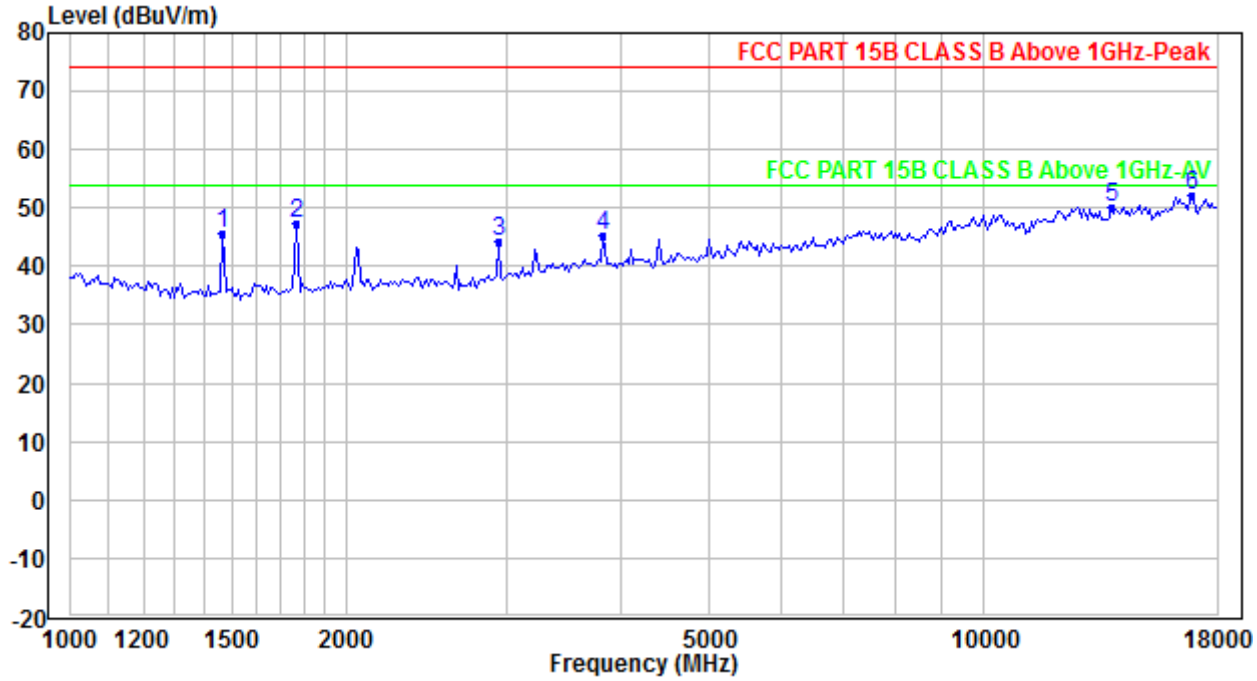
No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	56.071	50.36	-15.17	35.19	40.00	-4.81	QP
2	86.080	48.67	-13.86	34.81	40.00	-5.19	QP
3	99.069	48.30	-12.68	35.62	43.50	-7.88	QP
4	113.220	47.37	-11.86	35.51	43.50	-7.99	QP
5	590.351	38.21	0.61	38.82	46.00	-7.18	QP
6	887.398	31.74	4.94	36.68	46.00	-9.32	QP

Above 1GHz(Peak & Average)
Mode5
Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1465.642	58.88	-12.32	46.56	74.00	-27.44	Peak
2	1764.113	55.06	-11.00	44.06	74.00	-29.94	Peak
3	2936.954	52.50	-7.48	45.02	74.00	-28.98	Peak
4	4405.422	48.53	-3.68	44.85	74.00	-29.15	Peak
5	12642.190	40.50	9.34	49.84	74.00	-24.16	Peak
6	16888.890	39.77	12.26	52.03	74.00	-21.97	Peak

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1465.642	58.88	-13.17	45.71	74.00	-28.29	Peak
2	1764.113	58.99	-11.69	47.30	74.00	-26.70	Peak
3	2936.954	52.50	-8.23	44.27	74.00	-29.73	Peak
4	3833.661	49.96	-4.59	45.37	74.00	-28.63	Peak
5	13789.740	38.73	11.42	50.15	74.00	-23.85	Peak
6	16888.890	39.76	12.49	52.25	74.00	-21.75	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 6 Section 6.1

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:

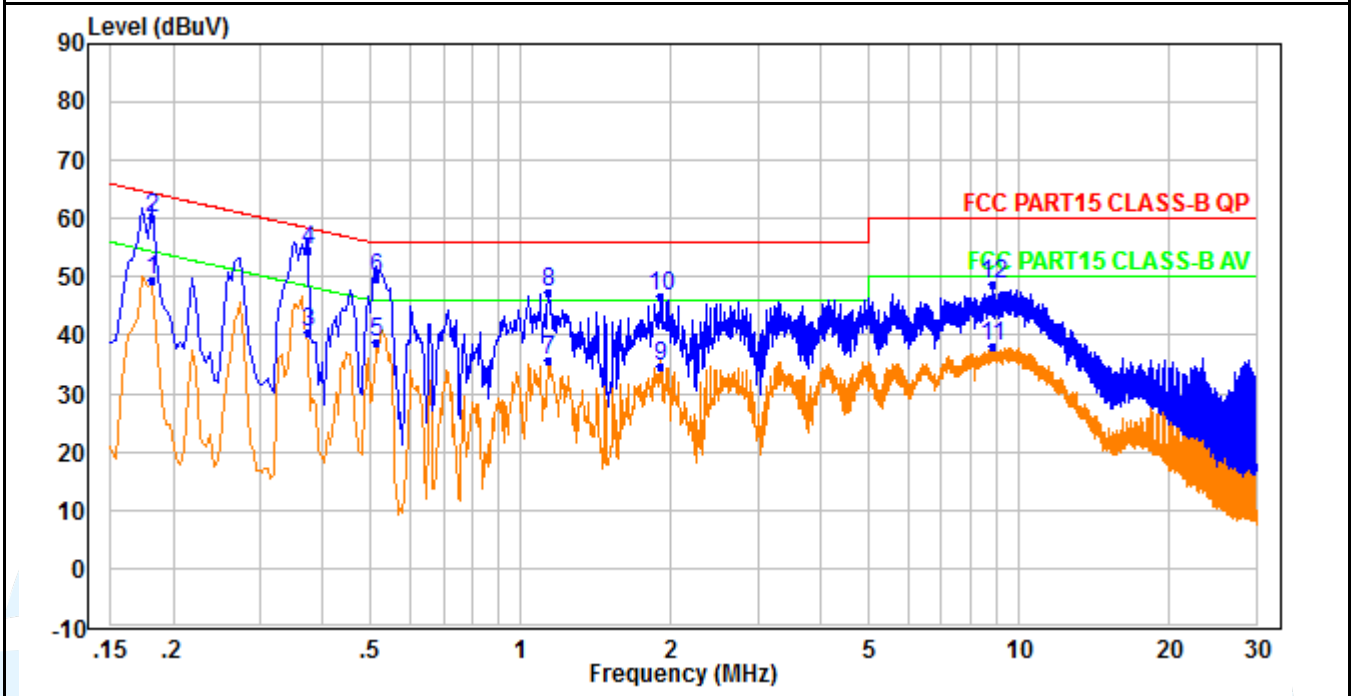
1) The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).
2) The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak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

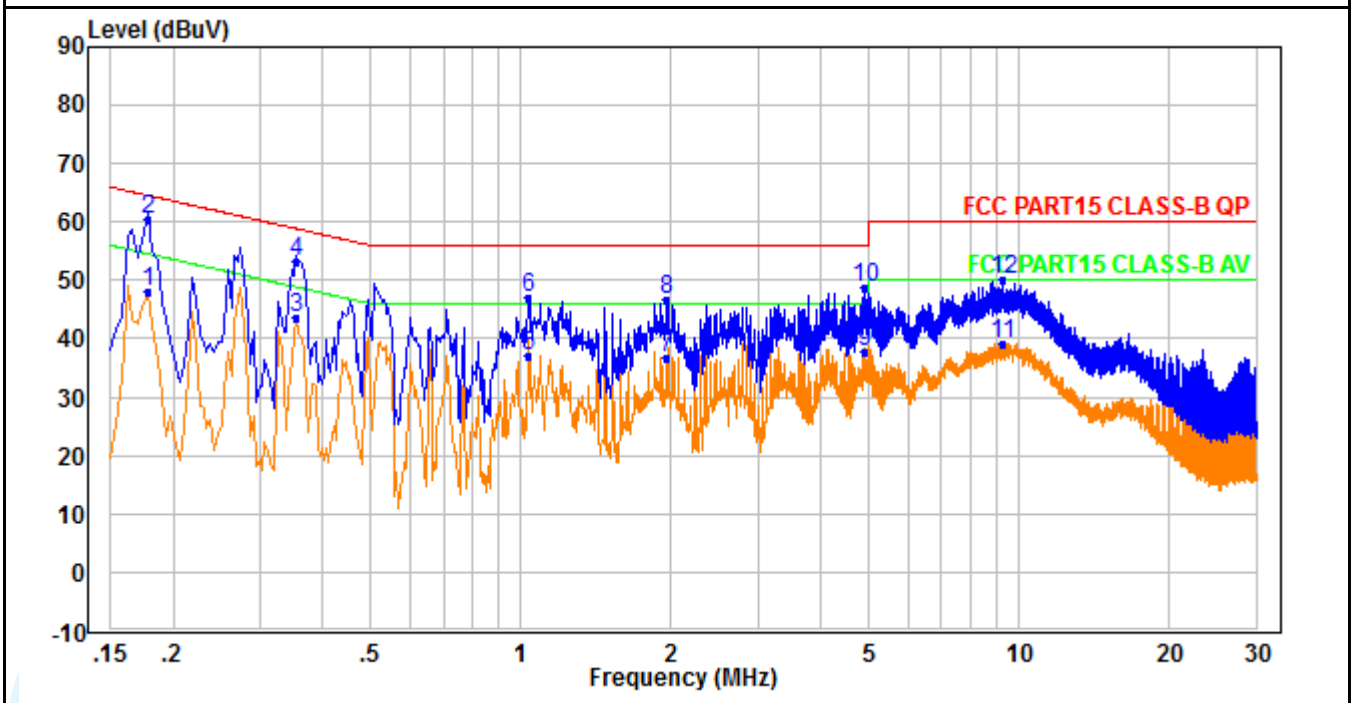
The measurement data as follows:
Quasi Peak and Average:
Mode 8

Live Line



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.182	40.57	9.04	49.61	54.39	-4.78	Average
2	0.182	50.99	9.04	60.03	64.39	-4.36	QP
3	0.374	31.32	9.18	40.50	48.41	-7.91	Average
4	0.374	45.45	9.18	54.63	58.41	-3.78	QP
5	0.510	29.32	9.31	38.63	46.00	-7.37	Average
6	0.510	40.44	9.31	49.75	56.00	-6.25	QP
7	1.138	26.29	9.43	35.72	46.00	-10.28	Average
8	1.138	38.11	9.43	47.54	56.00	-8.46	QP
9	1.914	24.98	9.58	34.56	46.00	-11.44	Average
10	1.914	37.22	9.58	46.80	56.00	-9.20	QP
11	8.857	28.51	9.68	38.19	50.00	-11.81	Average
12	8.857	39.04	9.68	48.72	60.00	-11.28	QP

Neutral Line



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.178	39.06	9.04	48.10	54.58	-6.48	Average
2	0.178	51.39	9.04	60.43	64.58	-4.15	QP
3	0.354	34.51	9.17	43.68	48.87	-5.19	Average
4	0.354	44.16	9.17	53.33	58.87	-5.54	QP
5	1.038	27.69	9.41	37.10	46.00	-8.90	Average
6	1.038	37.65	9.41	47.06	56.00	-8.94	QP
7	1.966	27.11	9.59	36.70	46.00	-9.30	Average
8	1.966	36.95	9.59	46.54	56.00	-9.46	QP
9	4.922	27.97	9.63	37.60	46.00	-8.40	Average
10	4.922	39.15	9.63	48.78	56.00	-7.22	QP
11	9.257	29.62	9.66	39.28	50.00	-10.72	Average
12	9.257	40.51	9.66	50.17	60.00	-9.83	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 for EUT external and internal photographs.

********** 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.