FCC TEST REPORT

Product Name:	IP Set-top Box
Trade Mark:	N/A
FCC ID:	2ARDH-A350A
Model No.:	A350A
Add. Model No.:	A350
Report Number:	200117013EMC-1
Test Standards:	FCC 47 CFR Part 15 Subpart B ICES-003 Issue 6
Test Result:	PASS
Date of Issue:	March 4, 2020

Prepared for:

Zhongshan Hybroad Vision Trading Co., Ltd
Room 102, Yuxing Industrial Park, No.50 Yanjiangdongsi RD, Huoju Development Zone, Zhongshan, Guangdong Province, China

Prepared by:

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Approved by:	Billy Li Technical Director	Date:	March 4, 2020

Version

Version No.	Date	Description
V1.0	March 4, 2020	Original

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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Zhongshan Hybroad Vision Trading Co., Ltd
Address of Applicant:	Room 102, Yuxing Industrial Park, No.50 Yanjiangdongsi RD, Huoju Development Zone, Zhongshan, Guangdong Province, China
Manufacturer:	Zhongshan Hybroad Vision Trading Co., Ltd
Address of Manufacturer:	Room 102, Yuxing Industrial Park, No.50 Yanjiangdongsi RD, Huoju Development Zone, Zhongshan, Guangdong Province, China

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	IP Set-top Box
Model No.:	A350A
Add. Model No.:	A350
Trade Mark:	N/A
DUT Stage:	Identical Prototype
Rated Voltage:	12.0 V ⎓ 1 A
Classification of digital devices:	Class B
Highest Internal Frequency:	800MHz
Sample Received Date:	February 14, 2020
Sample Tested Date:	February 14, 2020 to February 21, 2020
Note: The additional model A350 is identical with the test model A350A except the model number for marketing purpose.	

1.2.2 Description of Accessories

Adapter	
Model No.:	TS-A012-120010
Input:	100-240 V~50/60 Hz 0.4 A
Output:	12.0 V ⎓ 1 A

Cable(1)	
Description:	Network Cable
Cable Type:	Unshielded without ferrite

Cable(2)	
Cable Type:	AV cable
Cable Type:	Unshielded without ferrite

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
Monitor	KTC	U32O2S	--	UnionTrust
USB Disk	Kingston	DT101 G2	--	UnionTrust

2) Support Cable

Cable No.	Description	Cable Type	Length	Supplied by
HDMI	1	Shielded with two ferrite	1.50	UnionTrust
AV	1	Unshielded without ferrite	1.00	Applicant
LAN Cable	2	Unshielded without ferrite	1.00	Applicant

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	±3.8 dB
2	Conducted emission 150KHz-30MHz	±3.4 dB
3	Radiated emission 9KHz-30MHz	±4.9 dB
4	Radiated emission 30MHz-1GHz	±4.7 dB
5	Radiated emission 1GHz-18GHz	±5.1 dB
6	Radiated emission 18GHz-26GHz	±5.2 dB
7	Radiated emission 26GHz-40GHz	±5.2 dB

2. TEST SUMMARY

EMISSION			
Description	**Standard**	**Result**	**Remarks**
Conducted Emission Test	FCC 47 CFR Part 15 Subpart B ANSI C63.4-2014 ICES-003 Issue 6	PASS	Minimun passin margin is 4.85dB at 13.561MHz
Radiated Emission Test (30-1000MHz)	FCC 47 CFR Part 15 Subpart B ANSI C63.4-2014 ICES-003 Issue 6	PASS	Minimun passin margin is 3.29dB at 32.640MHz
Radiated Emission Test (Above 1GHz)	FCC 47 CFR Part 15 Subpart B ANSI C63.4-2014 ICES-003 Issue 6	PASS	Minimun passin margin is 21.72dB at 13013.680MHz z

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	May 18, 2019	May 18, 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 18, 2019	May 18, 2020
☐	MXG X-Series RF Vector Signal Generator	KEYSIGHT	N5182B	MY51350267	Nov. 24, 2019	Nov. 23, 2020
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160333		

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	1. 120V/60Hz 2. 240V/50Hz	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	25.6	55	100.09	Andy Lin
Radiated Emission	23.3	51	100.62	Andy Lin

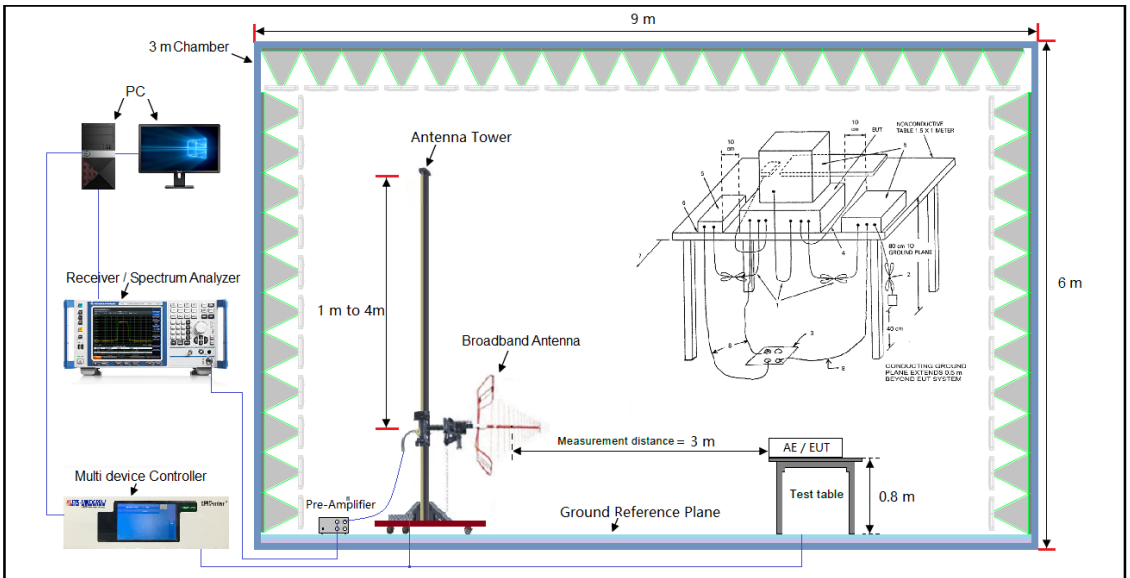
4.2 TEST MODES

Test Item	EMI Test Modes
Radiated Emission	Mode 1: USB Play + Lan(Ping 10% data) + HDMI OUT(120V60Hz) Mode 2: USB Play + Lan(Ping 10% data) + AV OUT(120V/60Hz) Mode 3: Worse from mode1~2(240V/50Hz)
Conducted Emission	Mode 1: USB Play + Lan(Ping 10% data) + HDMI OUT(120V60Hz) Mode 2: USB Play + Lan(Ping 10% data) + AV OUT(120V/60Hz) Mode 3: Worse from mode1~2(240V/50Hz)

4.3 TEST SETUP

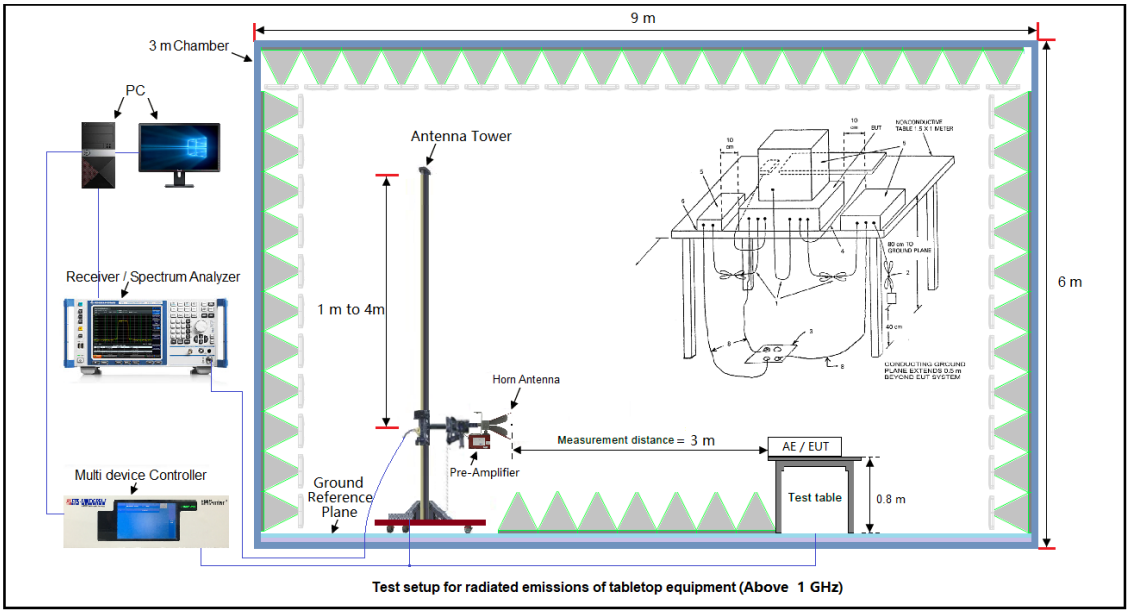
4.3.1 For Radiated Emissions test setup

Figure 1. 30MHz to 1GHz



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

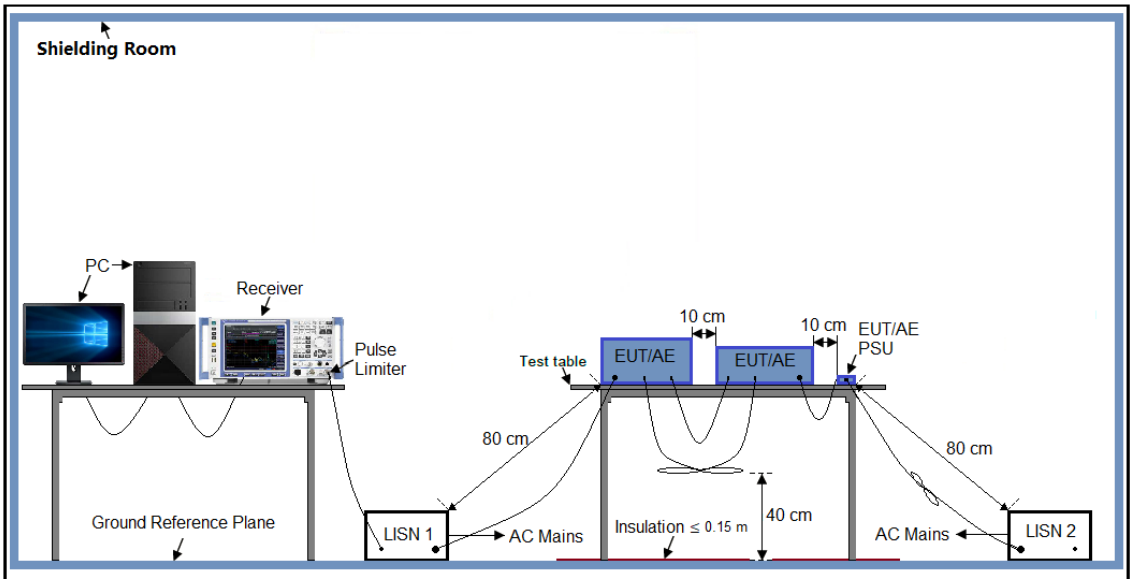
Figure 2. Above 1GHz



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

4.3.2 For Conducted Emissions test setup

Figure 3. Conducted Emissions setup



Test setup for conducted emissions of tabletop equipment (AC mains power ports)

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
5	ICES-003 Issue 6	Information Technology Equipment (Including Digital Apparatus) — Limits and Methods of Measurement

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:

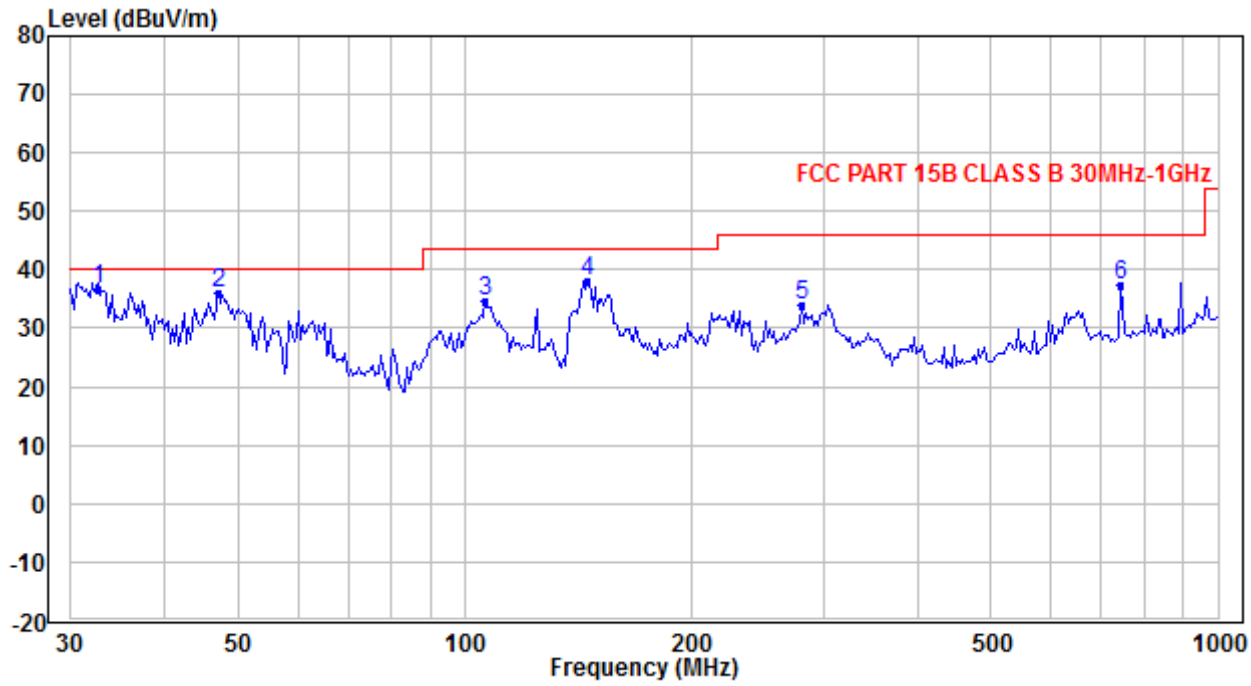
1) The Product was placed on the non-conductive turntable 0.8 m above the ground at a chamber.
2) Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal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

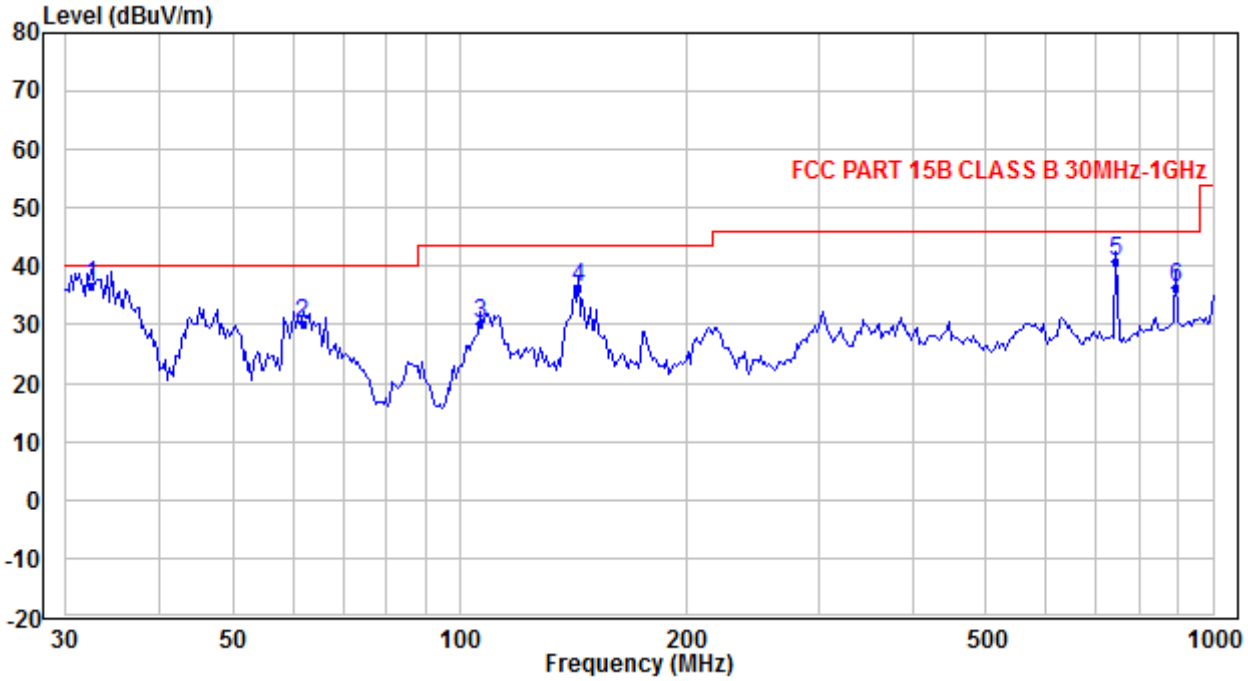
The worst measurement data as follows:

Below 1GHz(Quasi Peak):
Mode1
Horizontal



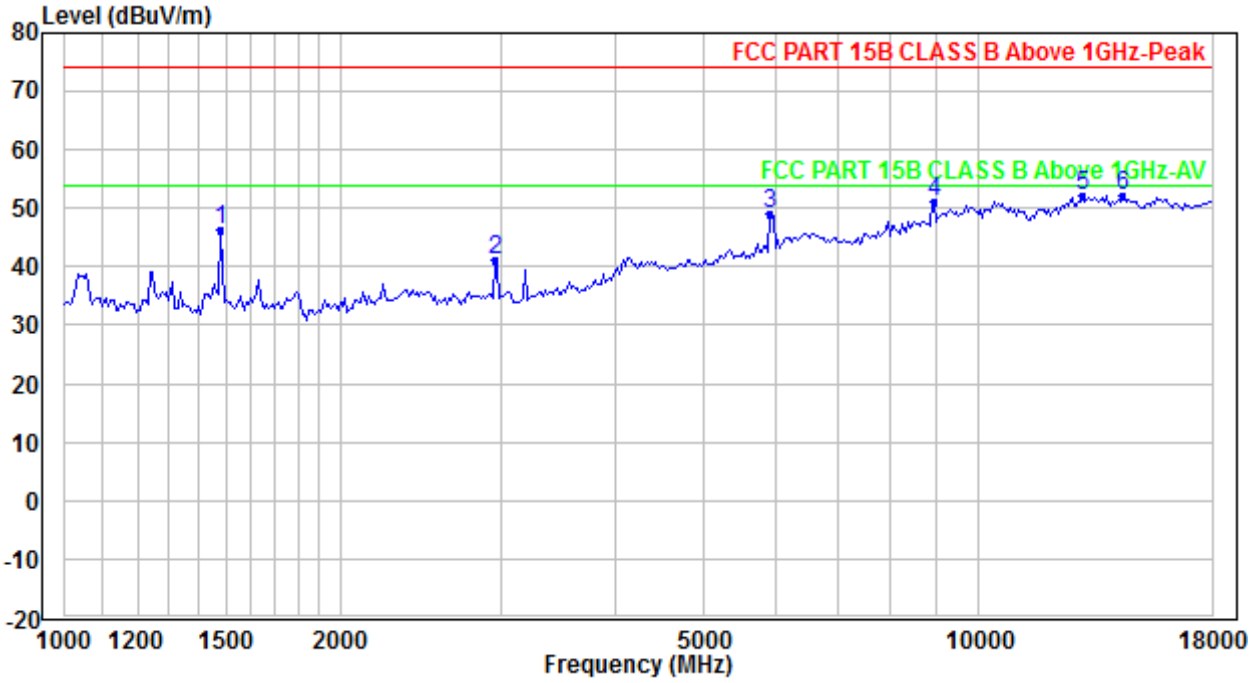
No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1*	32.640	43.75	-7.04	36.71	40.00	-3.29	QP
2	47.037	49.33	-13.47	35.86	40.00	-4.14	QP
3	106.281	47.22	-12.44	34.78	43.50	-8.72	QP
4	145.811	49.98	-11.78	38.20	43.50	-5.30	QP
5	280.294	40.61	-6.72	33.89	46.00	-12.11	QP
6	744.427	35.06	2.30	37.36	46.00	-8.64	QP

Vertical



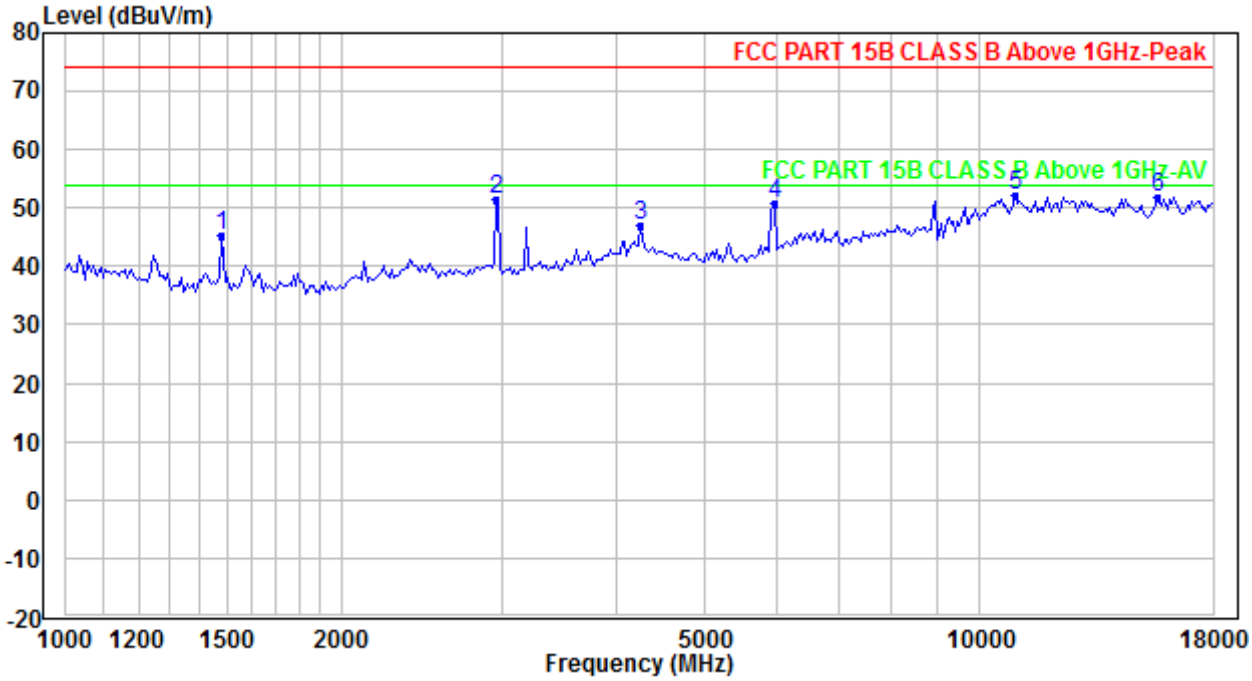
No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1*	32.411	43.50	-6.93	36.57	40.00	-3.43	QP
2	61.868	45.02	-14.74	30.28	40.00	-9.72	QP
3	106.281	42.67	-12.44	30.23	43.50	-13.27	QP
4	143.776	48.17	-11.97	36.20	43.50	-7.30	QP
5	744.427	39.74	0.95	40.69	46.00	-5.31	QP
6	893.656	32.46	4.02	36.48	46.00	-9.52	QP

Above 1GHz(Peak & Average)
Mode3
Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1*	1482.720	56.52	-10.30	46.22	74.00	-27.78	Peak
2	2954.015	40.75	0.27	41.02	74.00	-32.98	Peak
3	5919.457	42.69	6.28	48.97	74.00	-25.03	Peak
4	8930.747	43.17	8.13	51.30	74.00	-22.70	Peak
5	13013.680	39.83	12.45	52.28	74.00	-21.72	Peak
6	14360.350	38.40	13.76	52.16	74.00	-21.84	Peak

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1*	1482.720	55.46	-10.10	45.36	74.00	-28.64	Peak
2	2954.015	51.62	-0.02	51.60	74.00	-22.40	Peak
3	4254.946	42.71	4.43	47.14	74.00	-26.86	Peak
4	5953.844	44.72	6.15	50.87	74.00	-23.13	Peak
5	10937.880	42.79	9.24	52.03	74.00	-21.97	Peak
6	15663.860	39.77	11.96	51.73	74.00	-22.27	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. 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 Clause 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:

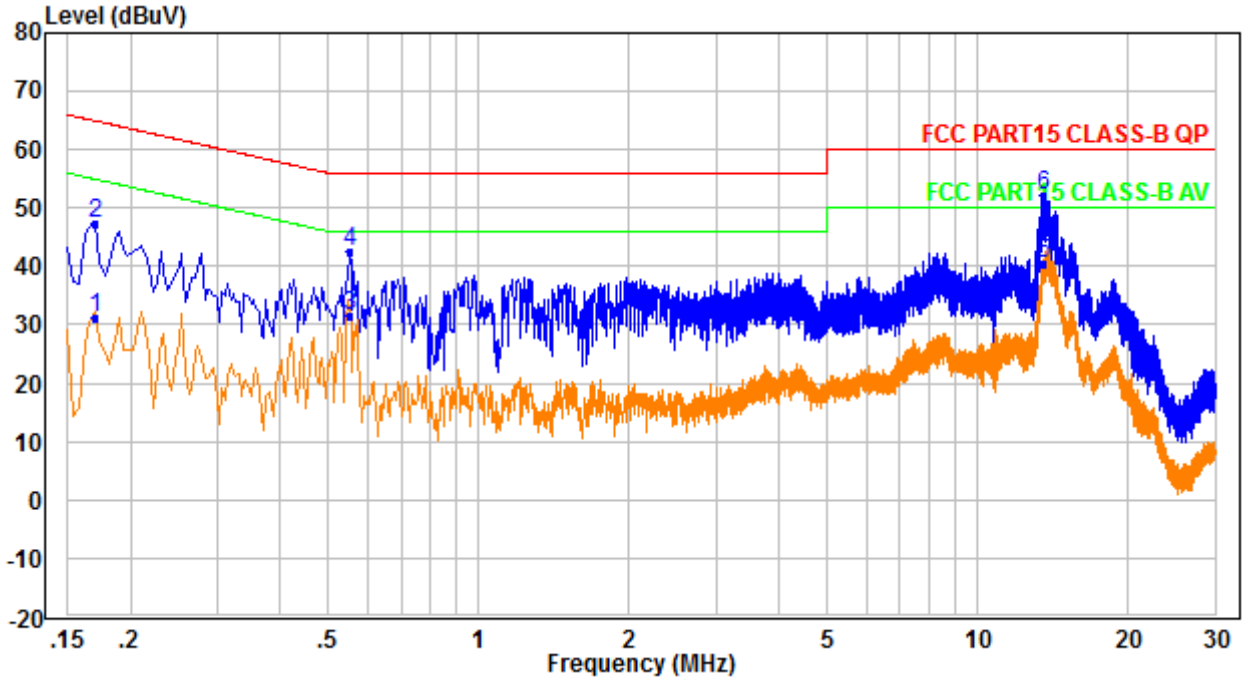
1) The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).
2) The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak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

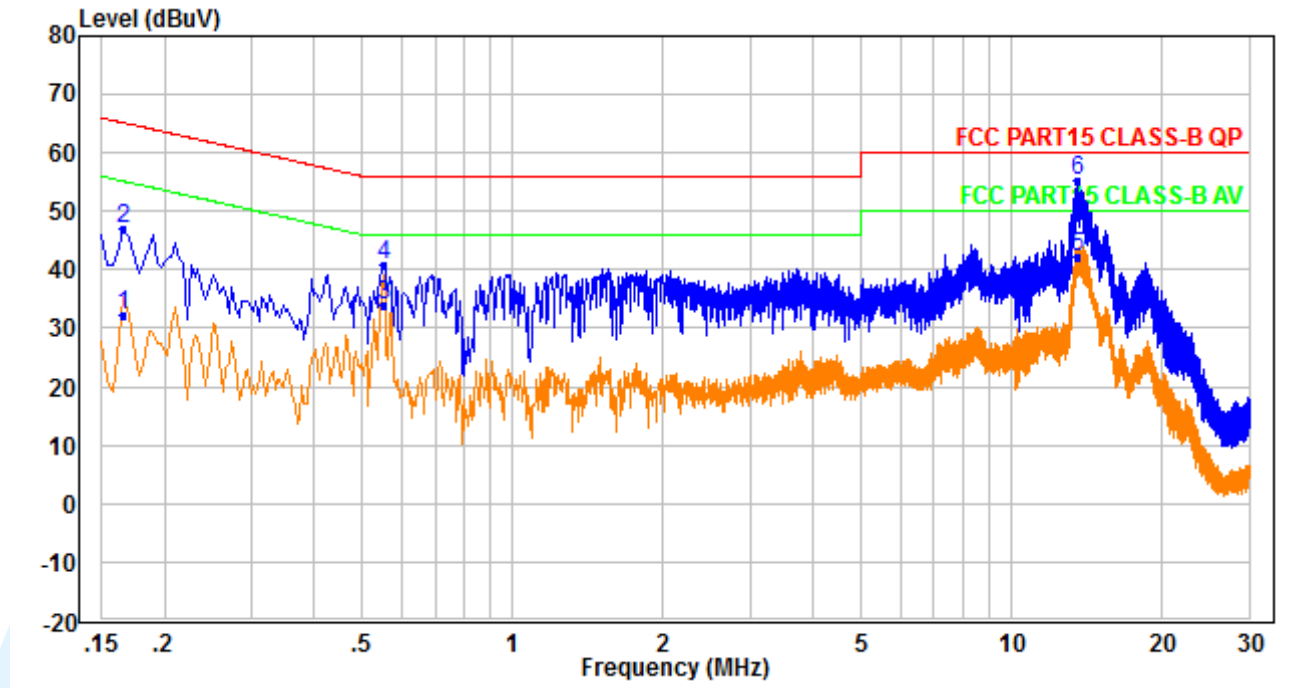
The worst measurement data as follows:
Quasi Peak and Average:
Mode 3

Live Line



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.170	21.23	10.02	31.25	54.96	-23.71	Average
2	0.170	37.23	10.02	47.25	64.96	-17.71	QP
3	0.550	21.63	10.00	31.63	46.00	-14.37	Average
4	0.550	32.63	10.00	42.63	56.00	-13.37	QP
5	13.537	27.69	12.62	40.31	50.00	-9.69	Average
6	13.537	39.69	12.62	52.31	60.00	-7.69	QP

Neutral Line



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.166	22.08	10.00	32.08	55.16	-23.08	Average
2	0.166	37.08	10.00	47.08	65.16	-18.08	QP
3	0.550	23.83	9.98	33.81	46.00	-12.19	Average
4	0.550	30.83	9.98	40.81	56.00	-15.19	QP
5	13.561	29.58	12.57	42.15	50.00	-7.85	Average
6	13.561	42.58	12.57	55.15	60.00	-4.85	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.