TEST REPORT

Product Name:	Intelligent Processing Card
Trade Mark:	Cambricon
Model No.:	MLU270-X5K
Add. Model No.:	MLU270-X5, MLU270-XV5K
Report Number:	200110005EMC-1
Test Standards:	FCC 47 CFR Part 15 Subpart B ICES-003 Issue 6
FCC ID:	2ARVF-MLU270-X
Test Result:	PASS
Date of Issue:	February 28, 2020

Prepared for:

Cambricon Technologies Corporation Limited
Room 1805, Building 1, Lane 2290, Zuchongzhi Road, Zhangjiang Hi-Tech Park, Shanghai, China

Prepared by:

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Date: February 28, 2020

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Version

Version No.	Date	Description
V1.0	February 28, 2020	Original

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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Cambricon Technologies Corporation Limited
Address of Applicant:	Room 1805, Building 1, Lane 2290, Zuchongzhi Road, Zhangjiang Hi-Tech Park, Shanghai, China
Manufacturer:	Cambricon Technologies Corporation Limited
Address of Manufacturer:	Room 1805, Building 1, Lane 2290, Zuchongzhi Road, Zhangjiang Hi-Tech Park, Shanghai, China

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Intelligent Processing Card
Model No.:	MLU270-X5K
Add. Model No.:	MLU270-X5, MLU270-XV5K
Trade Mark:	Cambricon
DUT Stage:	Production Unit
Rated Voltage:	12.0 V ⎓ 7.5 A
Classification of digital devices:	Class B
Highest Internal Frequency:	1.25 GHz
Software Version:	V1.1.3
Hardware Version:	V1.2
Sample Received Date:	January 13, 2020
Sample Tested Date:	January 15, 2020 to February 27, 2020

Note: The model of MLU270-X series Intelligent Processing Card description MLU270-X series are Intelligent Processing Card, the layout of PCB in the MLU270-X series are same, and the size are same too.
They contain three models, and the differences are as follows:

	MLU270-X5	MLU270-X5K	MLU270-XV5K
IPU	C20L Support max 1.0GHz	C20L Support max 1.25GHz	C20L Support max 1. 25GHz
Hashrate	INT8 128TOPS	INT8 160T0PS	INT8 160TOPS
Appearance	Silver and Blue	Silver and Blue	Silver

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
Computer host	DELL	Precision Tower 5820	NA	Applicant
LED Monitor	LG	U320S	187A3028-00001D	Union Trust

Mouse	DELL	MOCZUL	CN-0V7623-73826-65K-00XR	Union Trust
Keyboard	DELL	KB216t	CN-0RKR0N-71616-66O-0U4V-A03	Union Trust

2) Support Cable

Description	Quantity	Cable Type	Length (m)	Supplied by
Power Cable	1	Unshielded without ferrite	1.50	UnionTrust
HDMI Cable	1	Unshielded without ferrite	1.50	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	±3.8 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

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
☒	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
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	May 18, 2019	May 18, 2020
☒	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. 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	AC120/60Hz&AC240/50Hz	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	25.5	32.0	100.2	Andy Lin
Radiated Emission	25.3	53.0	100.1	Andy Lin

4.2 TEST MODES

Test Item	EMI Test Modes
Radiated Emission	TM1: Data processing(AC120V/60Hz) TM2: Data processing(AC240V/50Hz)
Conducted Emission	TM1: Data processing(AC120V/60Hz) TM2: Data processing(AC240V/50Hz)

4.3 TEST SETUP

4.3.1 For Radiated Emissions test setup

Figure 1. 30MHz to 1GHz

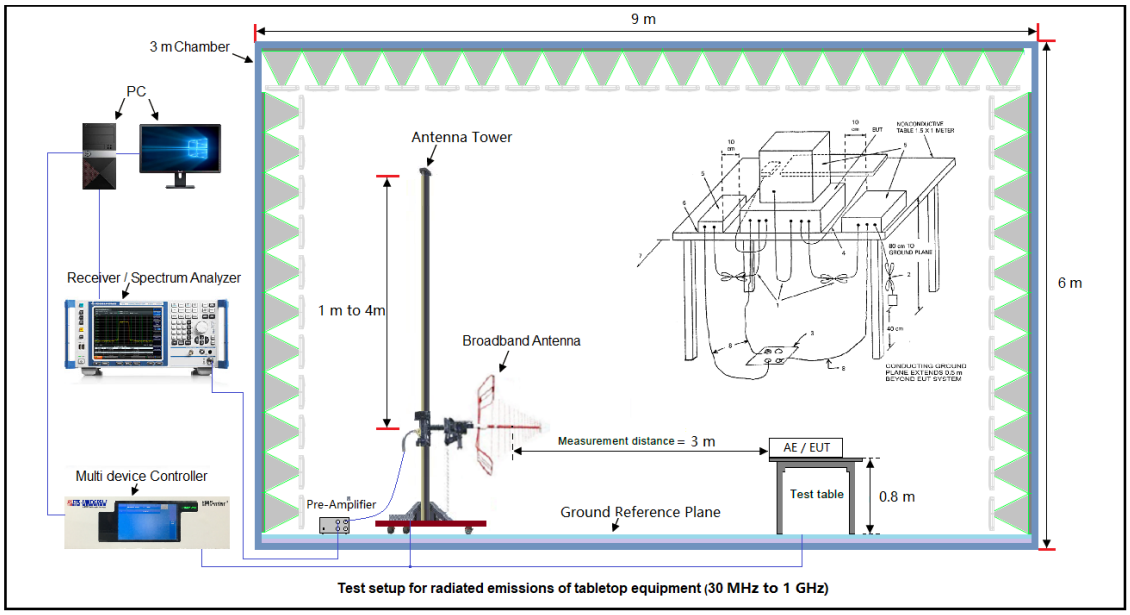
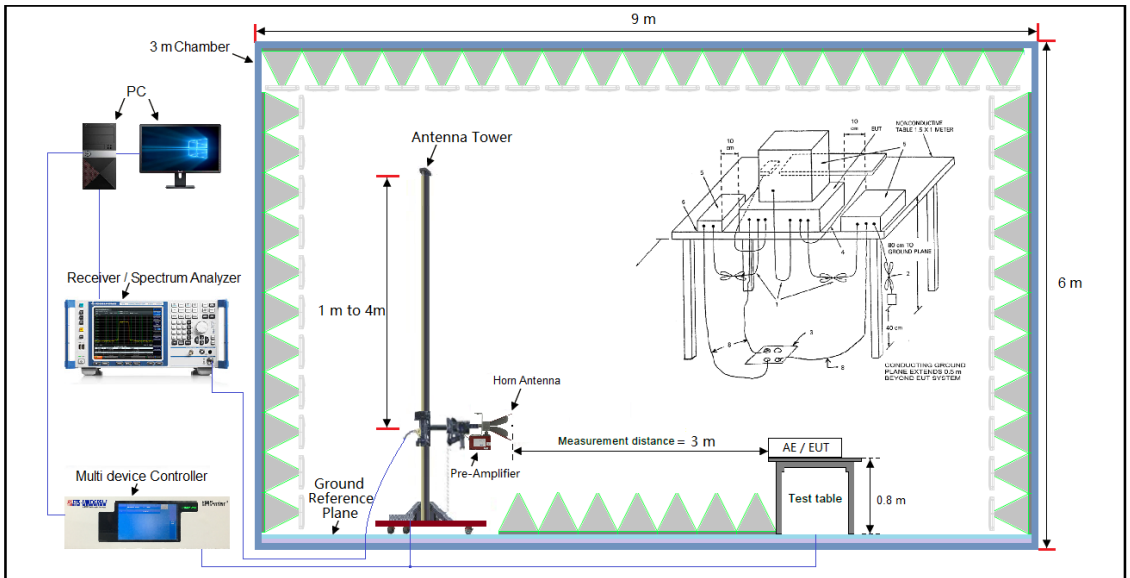


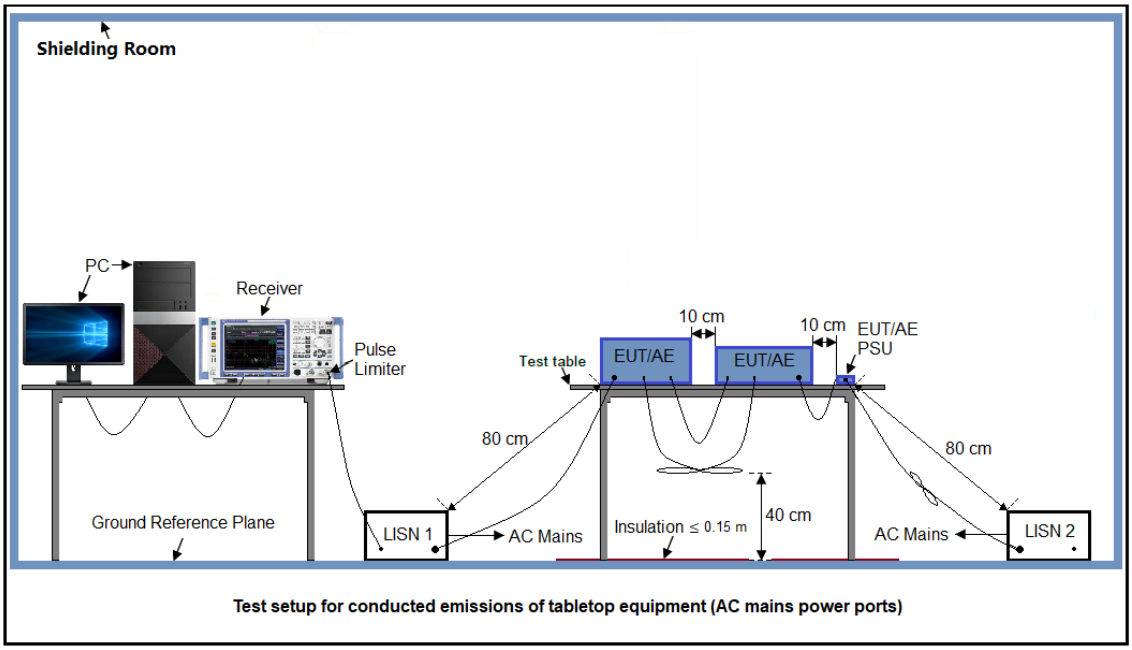
Figure 2. Above 1GHz



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	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:

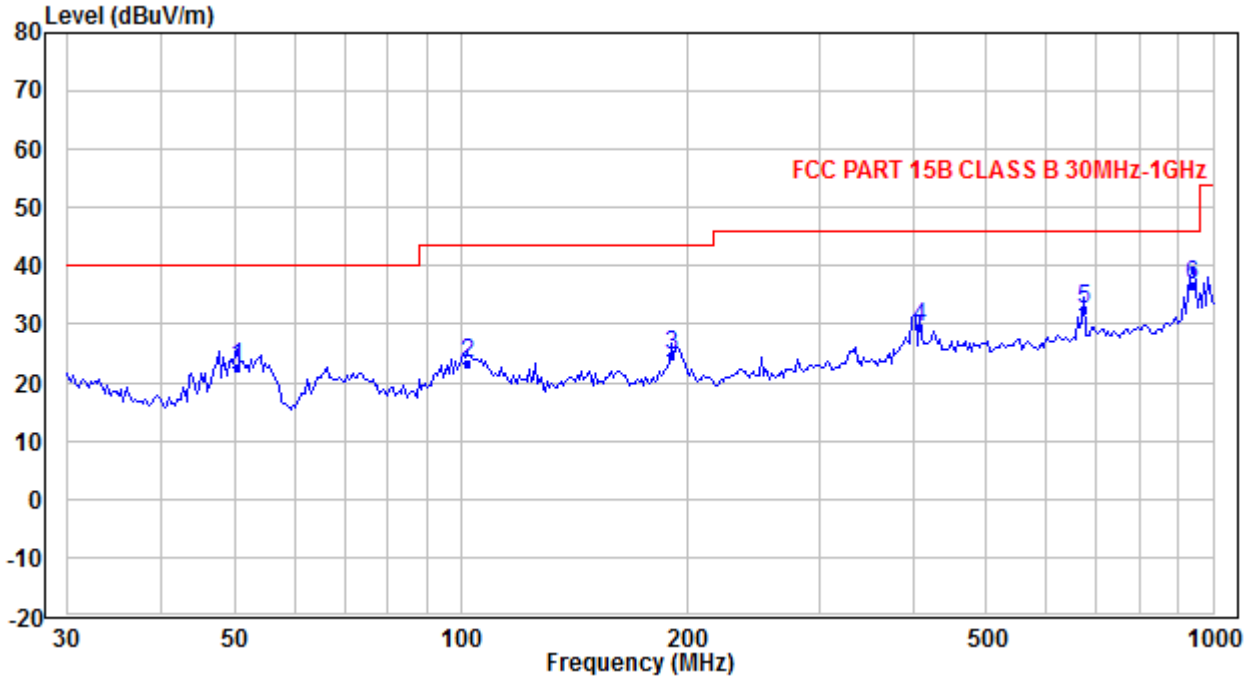
1) The Product was placed on the non-conductive turntable 0.8 m above the ground at a chamber.
2) Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal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

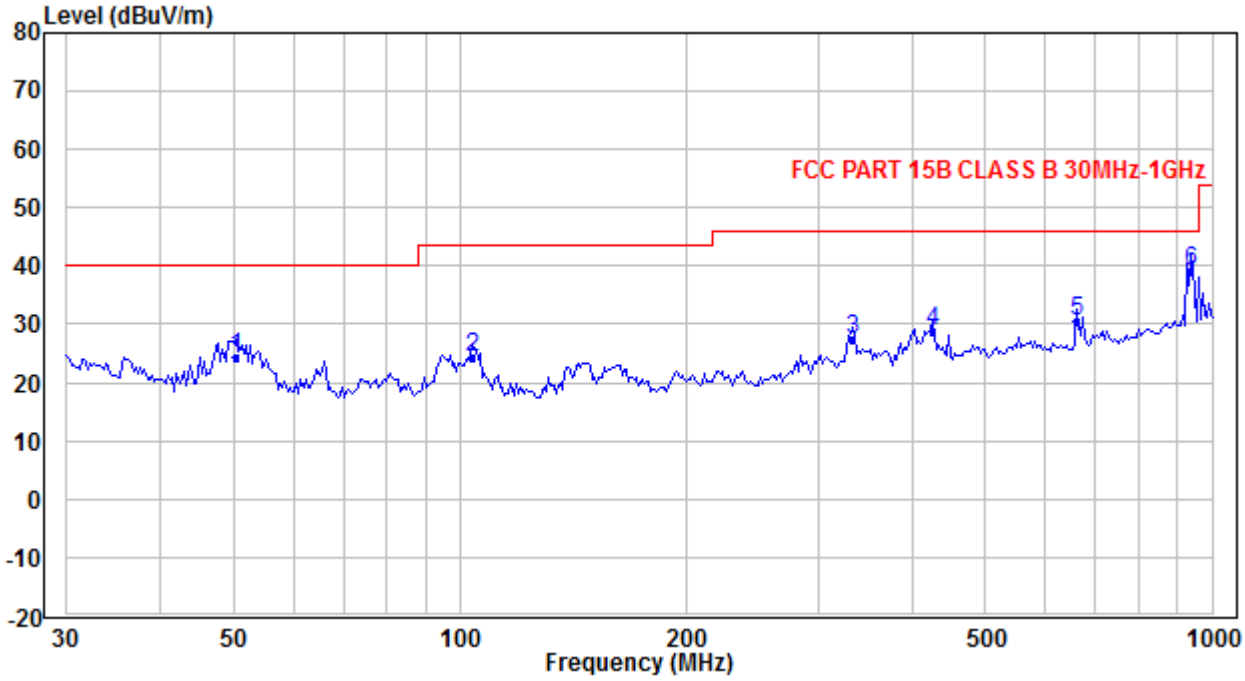
The measurement data as follows:

Below 1GHz(Quasi Peak):
TM2
Horizontal



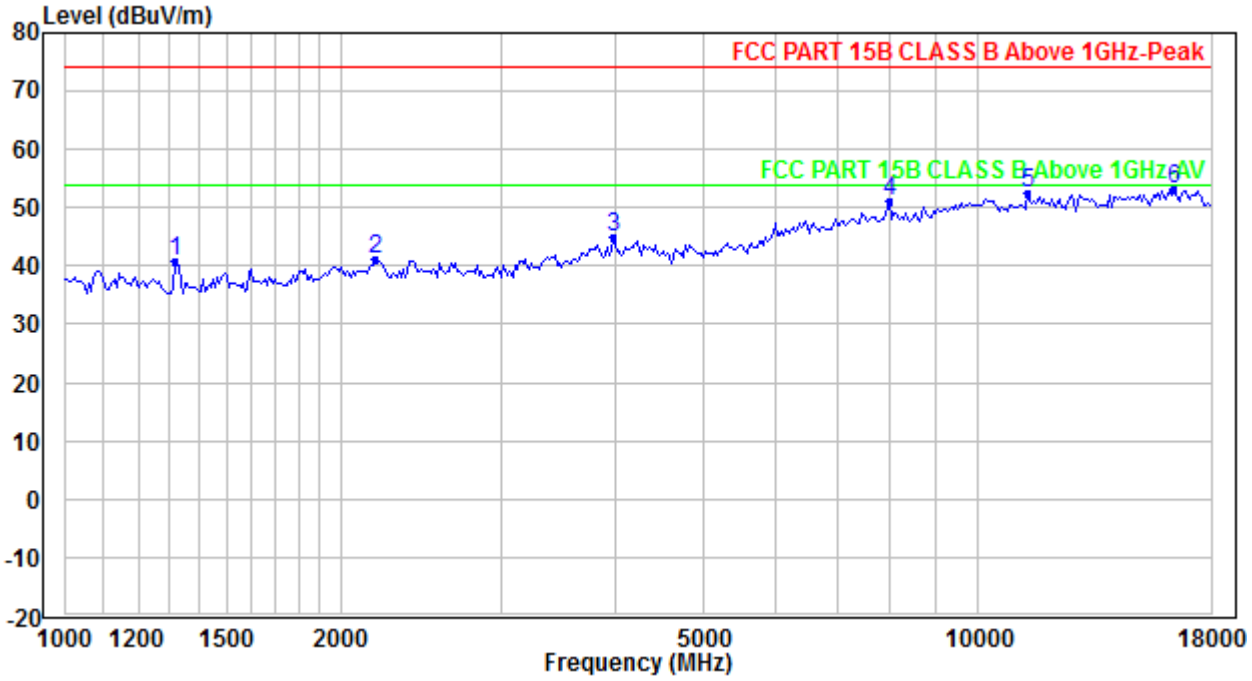
No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	50.461	37.27	-14.65	22.62	40.00	-17.38	QP
2	101.893	35.68	-12.37	23.31	43.50	-20.19	QP
3	190.441	35.09	-10.52	24.57	43.50	-18.93	QP
4	406.782	32.49	-2.89	29.60	46.00	-16.40	QP
5	674.677	30.46	2.20	32.66	46.00	-13.34	QP
6	938.714	30.94	5.73	36.67	46.00	-9.33	QP

Vertical



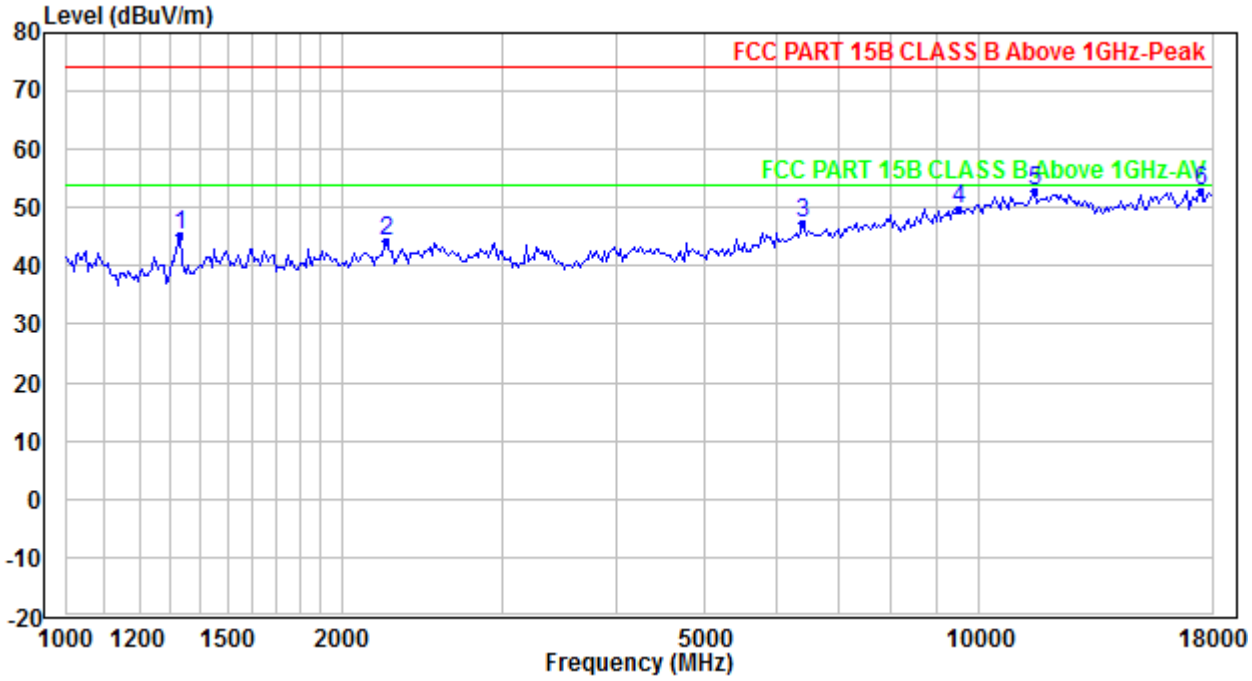
No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	50.461	39.39	-15.01	24.38	40.00	-15.62	QP
2	104.064	36.77	-12.40	24.37	43.50	-19.13	QP
3	331.786	33.03	-5.51	27.52	46.00	-18.48	QP
4	424.300	31.35	-2.53	28.82	46.00	-17.18	QP
5	660.602	30.71	-0.08	30.63	46.00	-15.37	QP
6	938.714	34.52	4.64	39.16	46.00	-6.84	QP

Above 1GHz(Peak & Average)
TM1
Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1320.528	51.46	-10.72	40.74	74.00	-33.26	Peak
2	2185.761	44.89	-3.58	41.31	74.00	-32.69	Peak
3	3992.296	40.38	4.48	44.86	74.00	-29.14	Peak
4	8000.034	43.81	7.23	51.04	74.00	-22.96	Peak
5	11324.690	43.00	9.35	52.35	74.00	-21.65	Peak
6	16406.780	40.04	13.11	53.15	74.00	-20.85	Peak

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1328.199	55.98	-10.53	45.45	74.00	-28.55	Peak
2	2236.995	47.25	-3.12	44.13	74.00	-29.87	Peak
3	6419.481	40.03	7.21	47.24	74.00	-26.76	Peak
4	9518.294	41.07	8.83	49.90	74.00	-24.10	Peak
5	11523.200	43.39	9.31	52.70	74.00	-21.30	Peak
6	17486.170	38.45	14.52	52.97	74.00	-21.03	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:

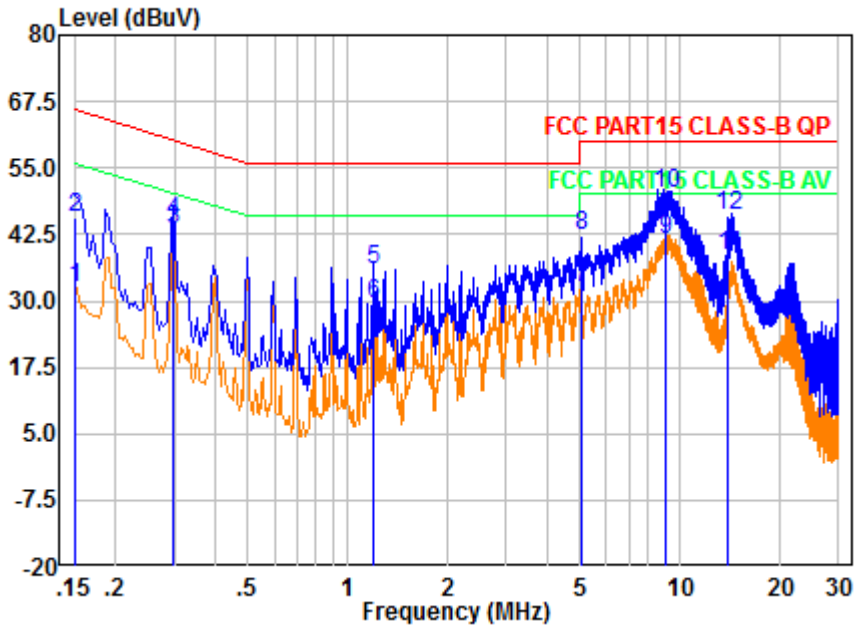
1) The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).
2) The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak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

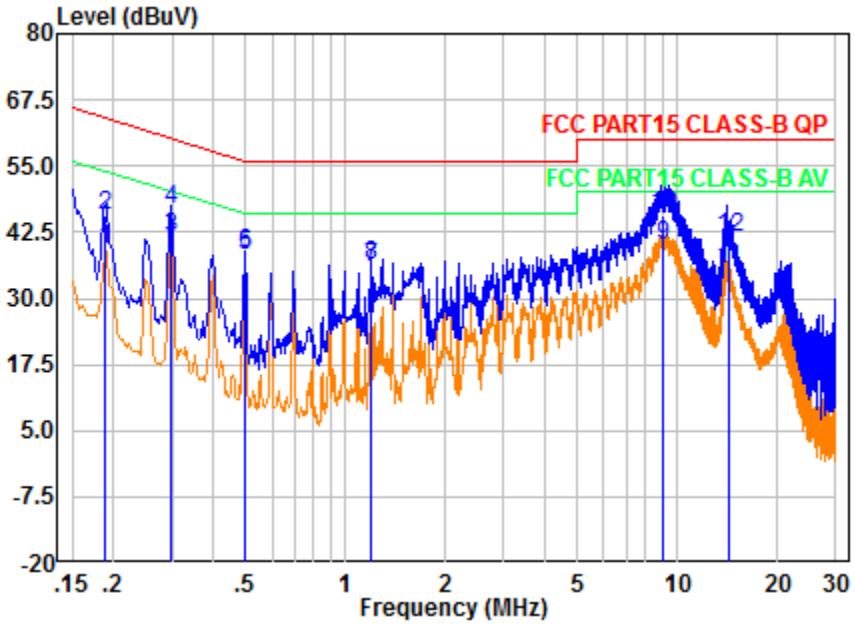
The measurement data as follows:
Quasi Peak and Average:
TM1

Live Line



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.150	21.65	10.96	32.61	55.97	-23.36	Average
2	0.150	34.71	10.96	45.67	65.97	-20.30	QP
3	0.297	32.72	10.76	43.48	50.32	-6.84	Average
4	0.297	34.02	10.76	44.78	60.32	-15.54	QP
5	1.191	25.31	10.51	35.82	46.00	-10.18	Average
6	1.191	19.01	10.51	29.52	56.00	-26.48	QP
7	5.073	22.52	10.12	32.64	50.00	-17.36	Average
8	5.073	32.31	10.12	42.43	60.00	-17.57	QP
9	9.002	31.33	10.08	41.41	50.00	-8.59	Average
10	9.002	40.28	10.08	50.36	60.00	-9.64	QP
11	14.004	28.41	10.25	38.66	50.00	-11.34	Average
12	14.004	35.93	10.25	46.18	60.00	-13.82	QP

Neutral Line



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.189	28.18	10.91	39.09	54.09	-15.00	Average
2	0.189	34.80	10.91	45.71	64.09	-18.38	QP
3	0.299	30.60	10.78	41.38	50.28	-8.90	Average
4	0.299	35.89	10.78	46.67	60.28	-13.61	QP
5	0.496	27.43	10.63	38.06	46.07	-8.01	Average
6	0.496	27.89	10.63	38.52	56.07	-17.55	QP
7	1.191	25.34	10.51	35.85	46.00	-10.15	Average
8	1.191	25.75	10.51	36.26	56.00	-19.74	QP
9	9.005	29.90	10.08	39.98	50.00	-10.02	Average
10	9.005	35.49	10.08	45.57	60.00	-14.43	QP
11	14.272	25.09	10.26	35.35	50.00	-14.65	Average
12	14.272	31.06	10.26	41.32	60.00	-18.68	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 ***

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