FCC TEST REPORT

Product Name:	Intelligent Accelerating Card
Trade Mark:	Cambricon
Model No.:	MLU370-X Series
Report Number:	210508005EMC-1
Test Standards:	FCC 47 CFR Part 15 Subpart B
FCC ID:	2ARVF-MLU370-X
Test Result:	PASS
Date of Issue:	July 28, 2021

Prepared for:

Cambricon Technologies Corporation Limited
11/F, Block D, Zhizhen Tower, No.7 Zhichun Road, Haidian District, Beijing, China

Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.
Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China
TEL: +86-755-2823 0888
FAX: +86-755-2823 0886

Prepared by:	Kieron Luo Project Engineer	Reviewed by:	Eric Yu Project Supervisor
Approved by:	Kevin Liang Assistant Manager	Date:	July 28, 2021

UnionTrust Laboratories

Version

Version No.	Date	Description
V1.0	July 28, 2021	Original

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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Cambricon Technologies Corporation Limited
Address of Applicant:	11/F, Block D, Zhizhen Tower, No.7 Zhichun Road, Haidian District, Beijing, China
Manufacturer:	Cambricon Technologies Corporation Limited
Address of Manufacturer:	11/F, Block D, Zhizhen Tower, No.7 Zhichun Road, Haidian District, Beijing, China

1.2 EUT INFORMATION

1.2.1 General Description of EUT

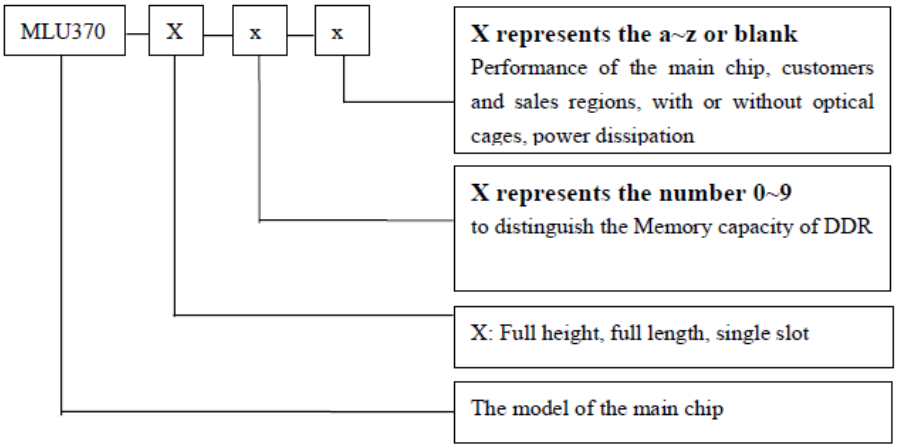
Product Name:	Intelligent Accelerating Card
Model No.:	MLU370-X4
Add. Model No.:	See Note
Trade Mark:	Cambricon
DUT Stage:	Production Unit
Rated Voltage:	12Vdc
Classification of digital devices:	Class B
Highest Internal Frequency:	1 GHz
Software Version:	V1.0
Hardware Version:	V1.0
Sample Received Date:	June 18, 2021
Sample Tested Date:	July 8, 2021 to July 17, 2021

Note: Product MODEL DESCRIPTION AND DIFFERENCE is attached below

MODEL DESCRIPTION AND DIFFERENCE

MLU370-X series are Intelligence Accelerating Card. They contain many models as follows and the main test model is MLU370-X4.

We Cambricon Technologies Corporation Limited. hereby declare that the layout of PCB in the MLU370-X series are same, and the size are same too. We'll be responsible for any consequences caused by other differences in the MLU370-X series.



1.2.2 Description of Accessories

Cable	
Description:	Coaxial cable
Cable Type:	Shielded without ferrite
Length:	1.0 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
Lenovo server	Lenovo	7X06	J300WMKL	Applicant
Monitor	DELL	D2421H	CN-OT4HMW-BO3 00-062-2VE-A00	UnionTrust
keyboard	DELL	KB212-B	CN-0N291F-7158-624-006P-A01	UnionTrust
Mouse	DELL	MS111-T	CN-0KW2YH-7161 6-5AH-0SV7	UnionTrust

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

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 – 3m SAC						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm dd, yyyy)**	**Cal. Due date (mm dd, yyyy)**
☒	3 m SAC	ETS-LINDGREN	3m	N/A	Jan. 22, 2021	Jan. 21, 2024
☒	Receiver	R&S	ESIB26	100114	Nov. 18, 2020	Nov. 17, 2021
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Nov. 14, 2020	Nov. 13, 2022
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	Nov. 14, 2020	Nov. 13, 2021
☒	Preamplifier	HP	8447F	2805A02960	Nov. 10, 2020	Nov. 9, 2021
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201541	Apr. 30, 2021	Apr. 29, 2023
☒	Preamplifier	ETS-Lindgren	118385	00201874	Nov. 10, 2020	Nov. 9, 2021
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160323		

Conducted Emission Test						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm dd, yyyy)**	**Cal. Due date (mm dd, yyyy)**
☒	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
☒	Receiver	R&S	ESR7	101181	Nov. 18, 2020	Nov.17, 2021
☒	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	Nov. 18, 2020	Nov.17, 2021
☒	Shielding room	ETS-Lindgren	843	Euroshiedpn-C T001270-1246	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.1603323		

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	120Vac~60Hz	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	24.8	54.0	99.7	David Zhang
Radiated Emission	24.7	68.0	99.1	Fire Huo

4.2 TEST MODES

Test Item	Test Modes
Radiated Emission	Test Mode 1: Normal working
Conducted Emission	Test Mode 1: Normal working

4.3 TEST SETUP

4.3.1 For Radiated Emissions test setup

Figure 1. 30MHz to 1GHz

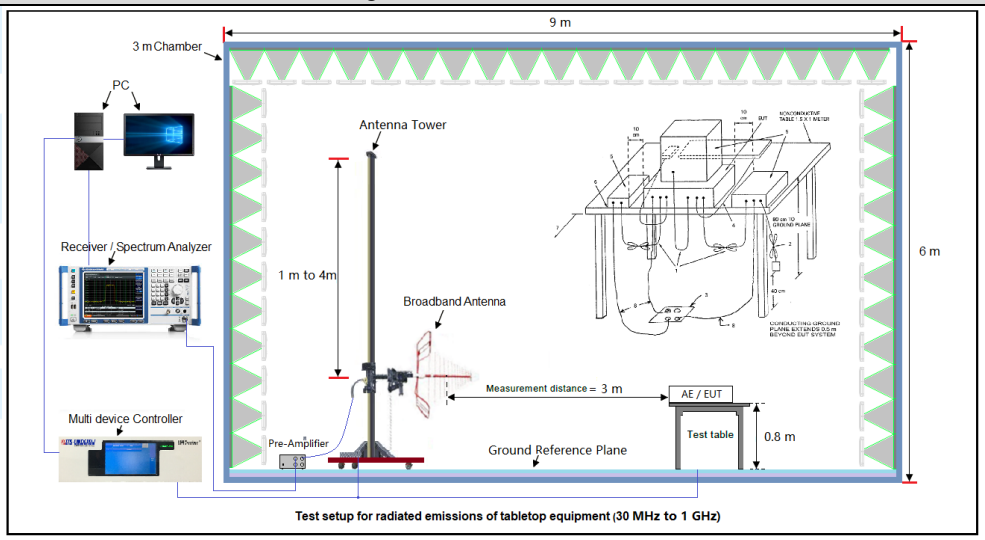
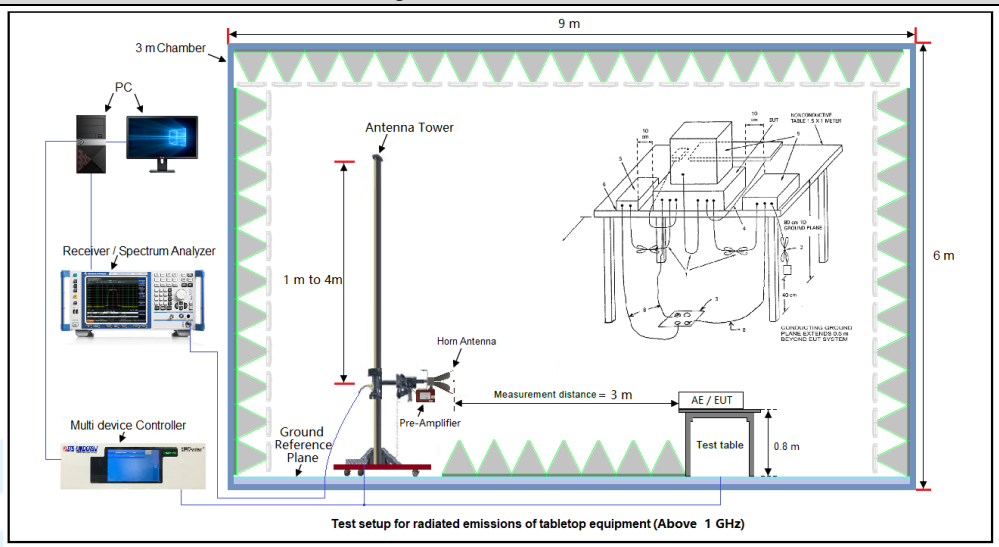
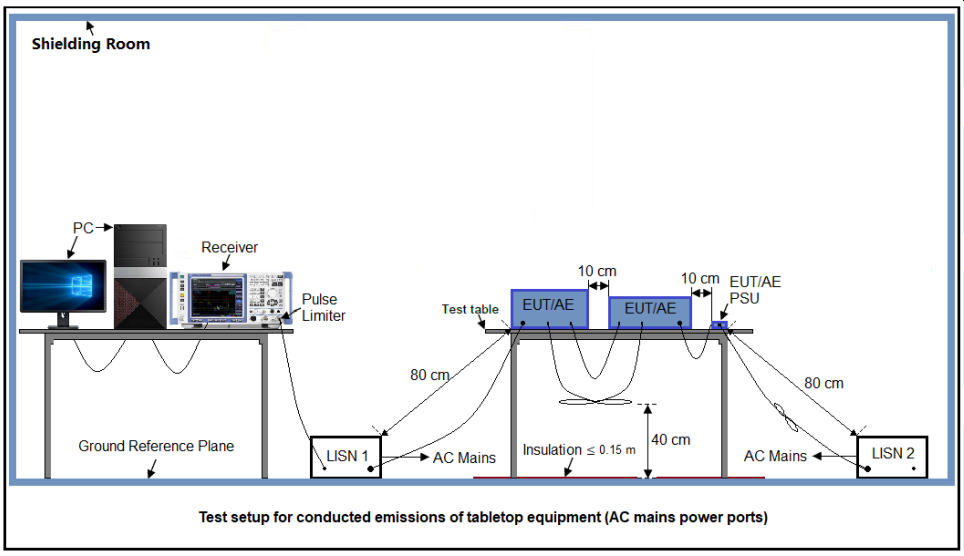


Figure 2. Above 1GHz



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	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 ≤ 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:

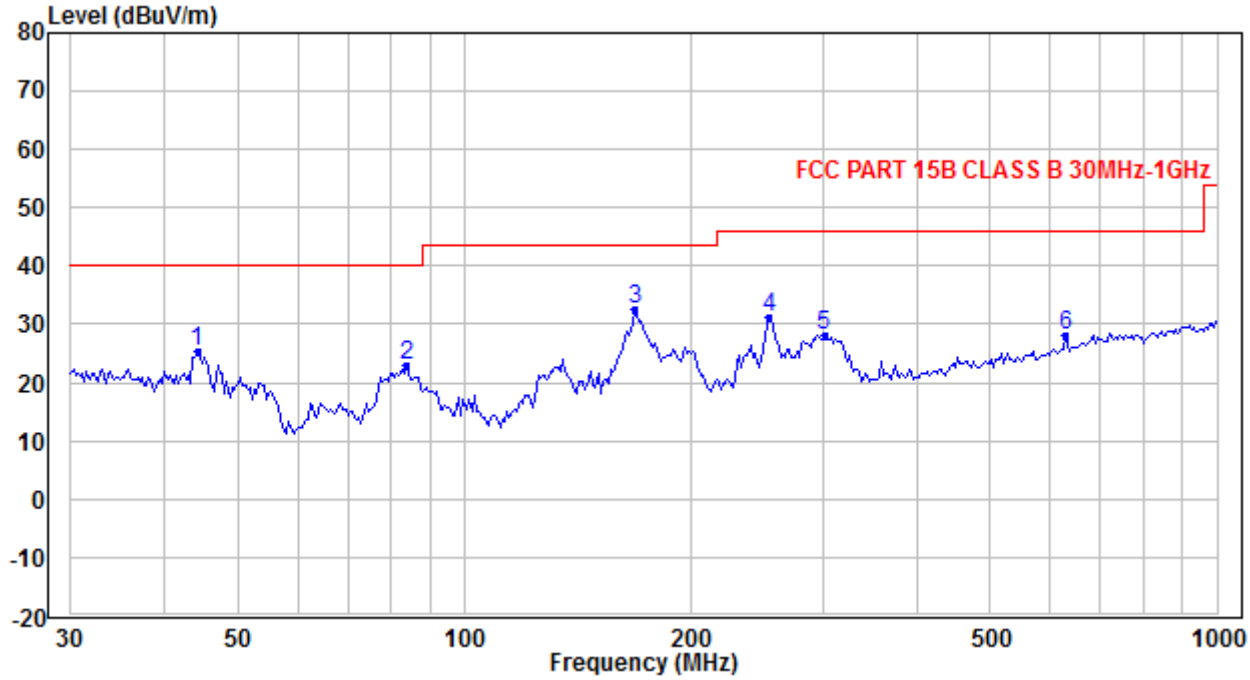
1) The Product was placed on the non-conductive turntable 0.8 m above the ground at a chamber.
2) Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal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

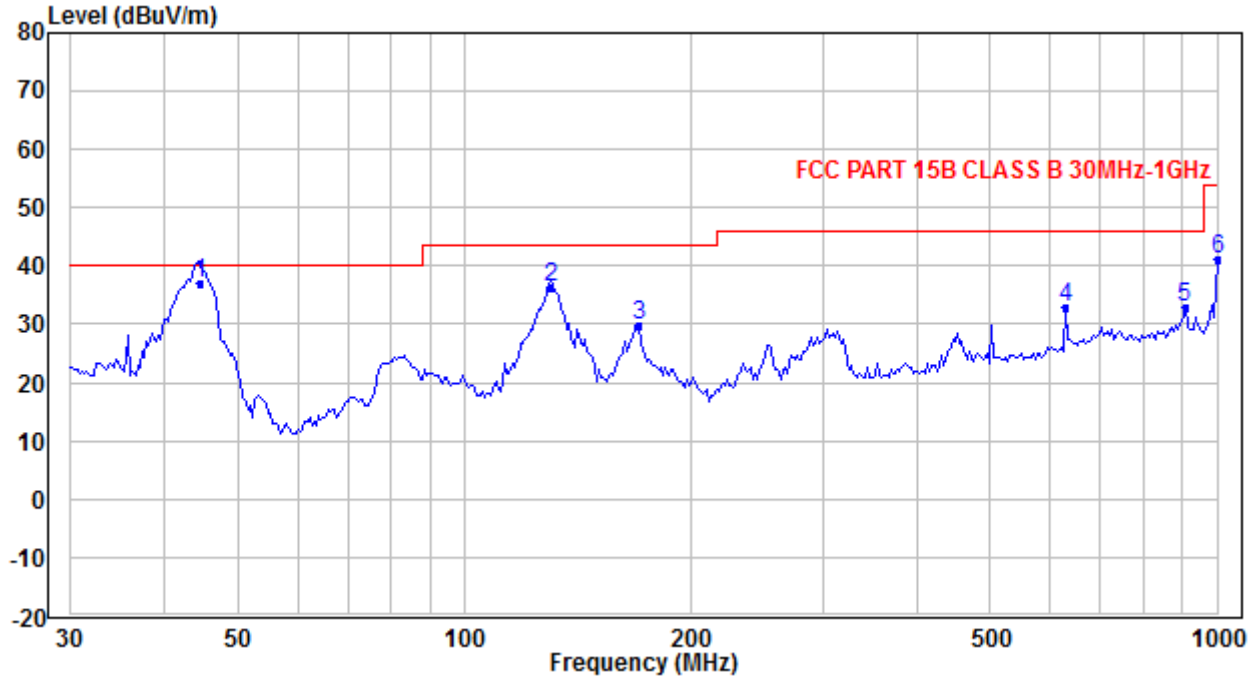
The measurement data as follows:

Below 1GHz (Quasi Peak):
Test Mode 1
Horizontal



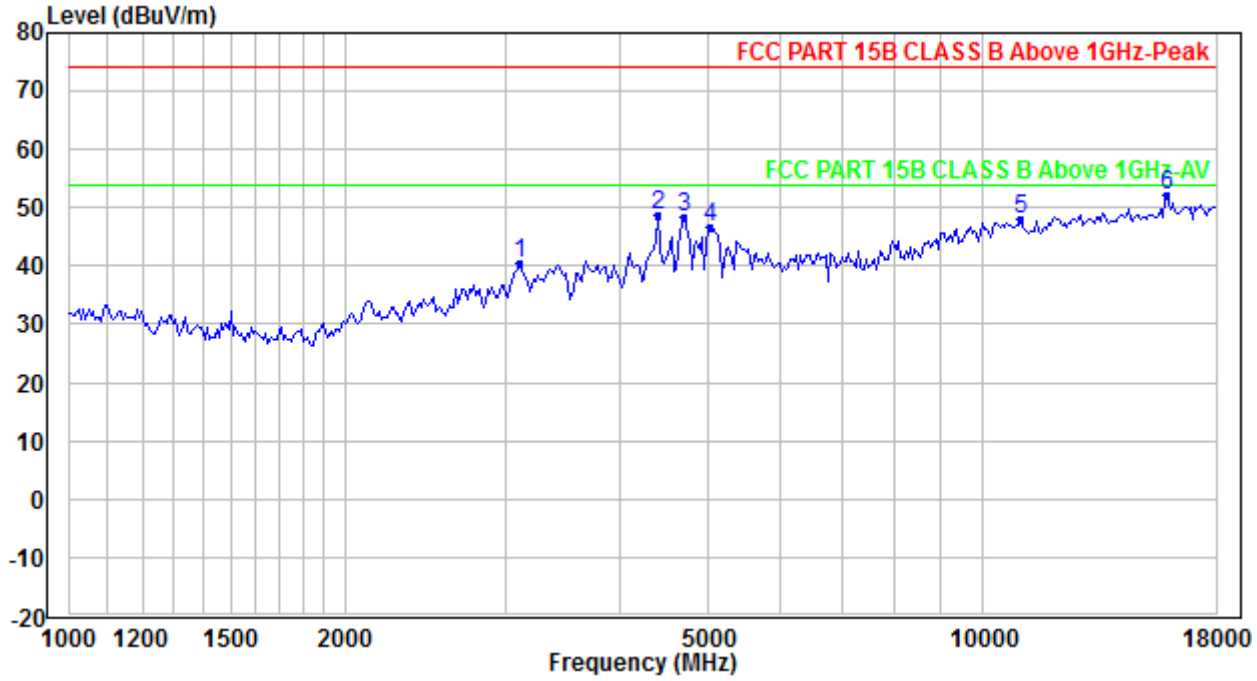
No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	44.154	36.11	-10.77	25.34	40.00	-14.66	QP
2	83.694	39.82	-17.02	22.80	40.00	-17.20	QP
3	168.997	44.20	-11.55	32.65	43.50	-10.85	QP
4	254.031	39.79	-8.70	31.09	46.00	-14.91	QP
5	300.699	34.73	-6.60	28.13	46.00	-17.87	QP
6	628.894	28.58	-0.35	28.23	46.00	-17.77	QP

Vertical



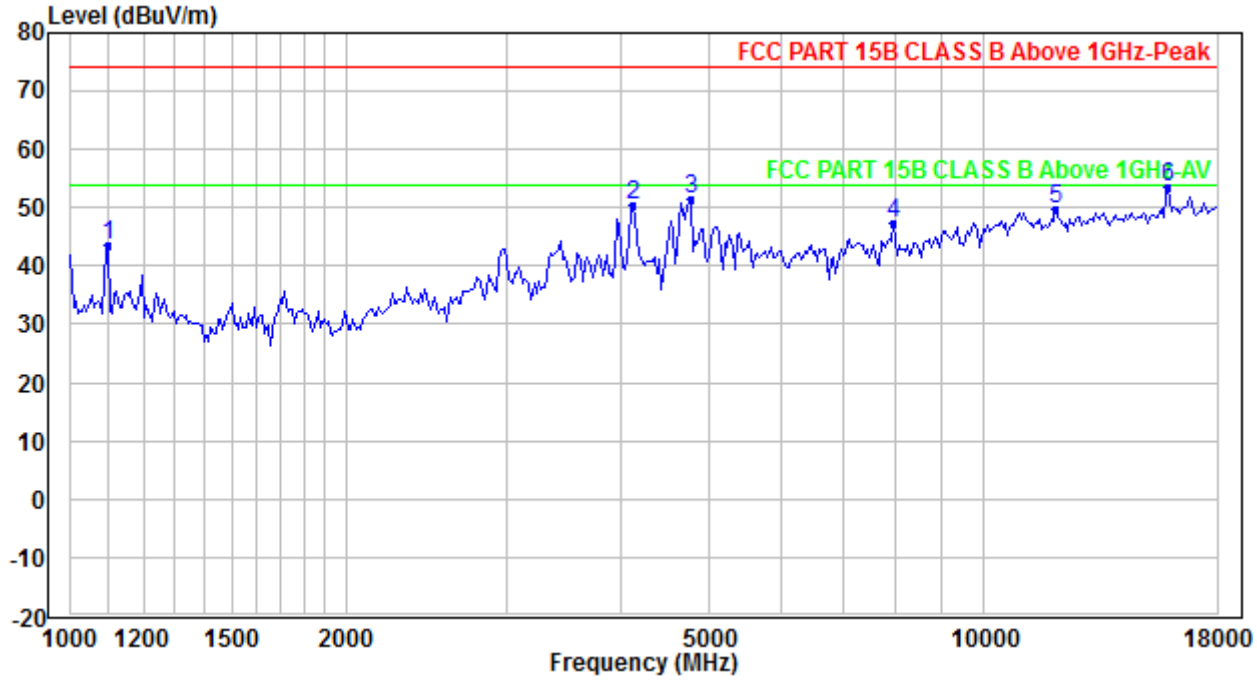
No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	44.670	48.16	-11.19	36.97	40.00	-3.03	QP
2	130.305	52.08	-15.73	36.35	43.50	-7.15	QP
3	170.189	41.30	-11.39	29.91	43.50	-13.59	QP
4	628.894	33.18	-0.35	32.83	46.00	-13.17	QP
5	906.304	28.57	4.29	32.86	46.00	-13.14	QP
6	1000.000	35.95	5.30	41.25	54.00	-12.75	QP

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



No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	3112.096	46.82	-6.28	40.54	74.00	-33.46	Peak
2	4405.422	51.28	-2.58	48.70	74.00	-25.30	Peak
3	4695.251	50.73	-2.42	48.31	74.00	-25.69	Peak
4	5033.218	48.83	-2.11	46.72	74.00	-27.28	Peak
5	11001.420	40.62	7.42	48.04	74.00	-25.96	Peak
6	15938.420	40.52	11.75	52.27	74.00	-21.73	Peak

Vertical



No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	1097.108	57.02	-13.32	43.70	74.00	-30.30	Peak
2	4133.483	53.51	-2.90	50.61	74.00	-23.39	Peak
3	4777.554	53.97	-2.37	51.60	74.00	-22.40	Peak
4	7953.829	44.74	2.45	47.19	74.00	-26.81	Peak
5	12000.030	41.83	7.85	49.68	74.00	-24.32	Peak
6	15938.420	41.64	11.75	53.39	74.00	-20.61	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. For Radiated Emission above 18GHz, there was not any unwanted emission detected.
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

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:

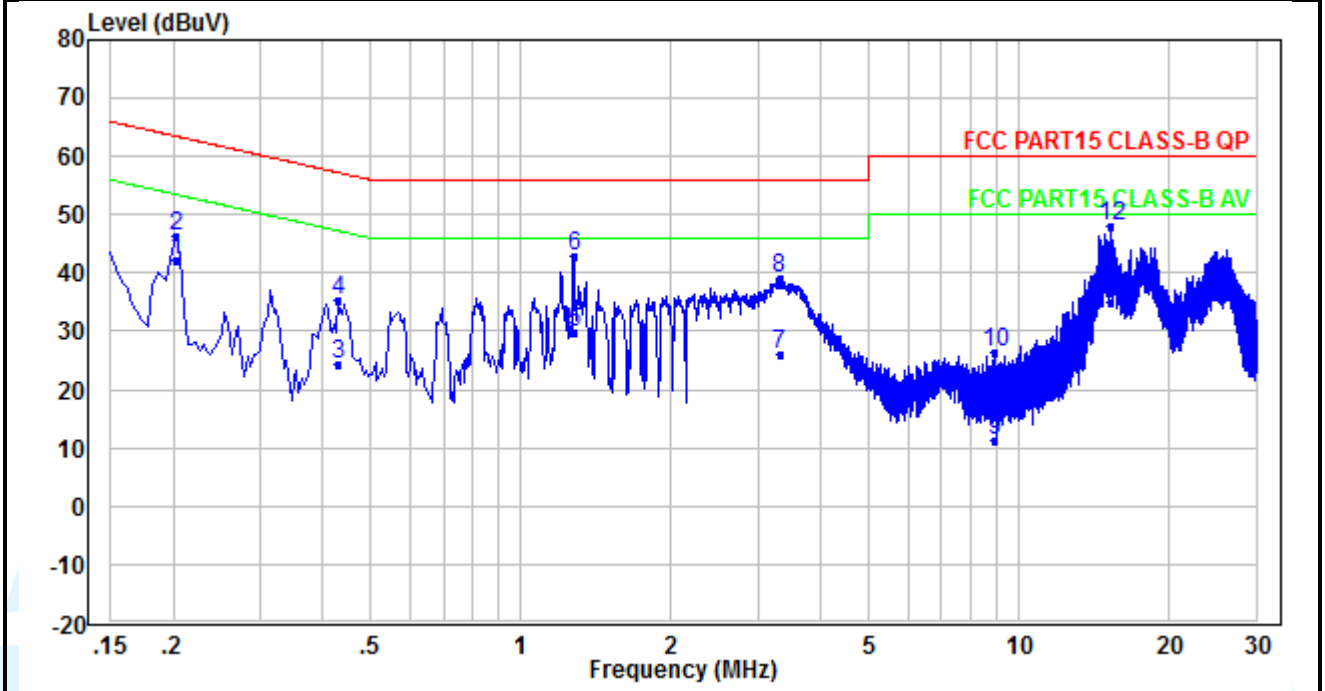
1) The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).
2) The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak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

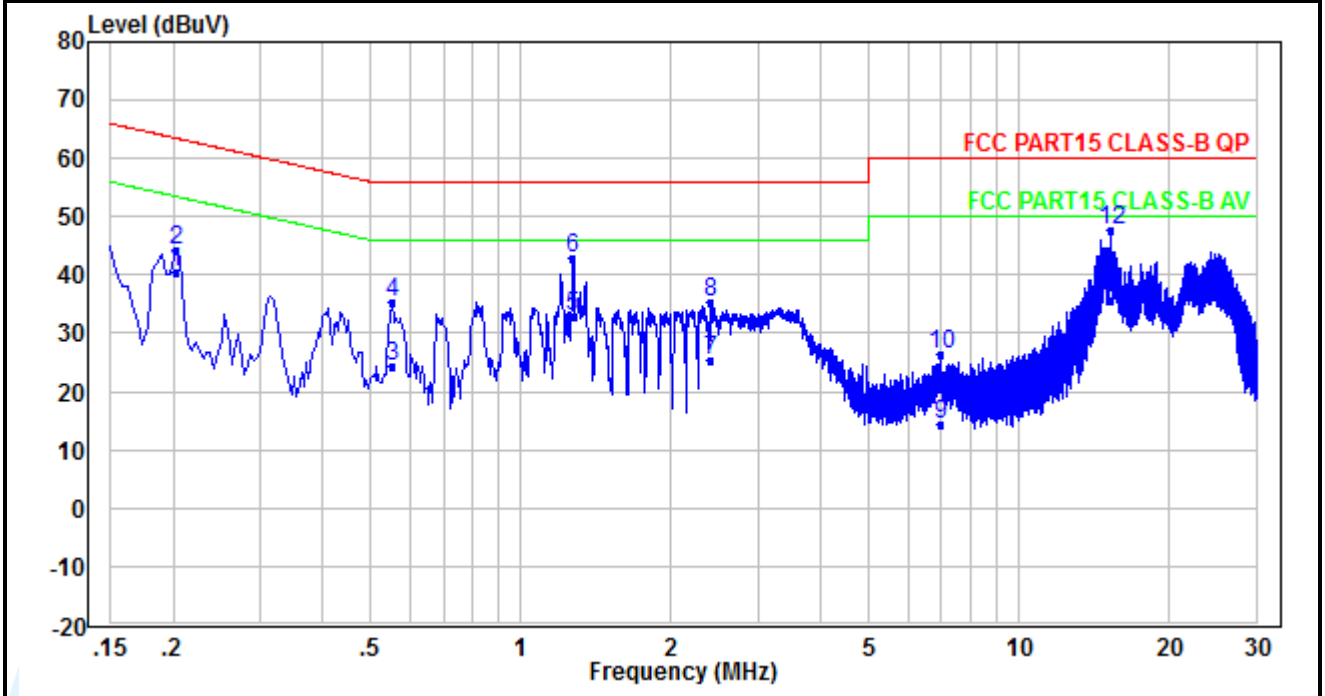
The measurement data as follows:
Quasi Peak and Average:
Test Mode 1

Live Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.202	32.49	9.74	42.23	53.53	-11.30	Average
2	0.202	36.49	9.74	46.23	63.53	-17.30	QP
3	0.430	14.65	9.81	24.46	47.25	-22.79	Average
4	0.430	25.65	9.81	35.46	57.25	-21.79	QP
5	1.278	20.10	9.89	29.99	46.00	-16.01	Average
6	1.278	33.10	9.89	42.99	56.00	-13.01	QP
7	3.310	16.10	10.00	26.10	46.00	-19.90	Average
8	3.310	29.10	10.00	39.10	56.00	-16.90	QP
9	8.993	1.10	10.24	11.34	50.00	-38.66	Average
10	8.993	16.10	10.24	26.34	60.00	-33.66	QP
11	15.265	24.72	10.40	35.12	50.00	-14.88	Average
12	15.265	37.72	10.40	48.12	60.00	-11.88	QP

Neutral Line

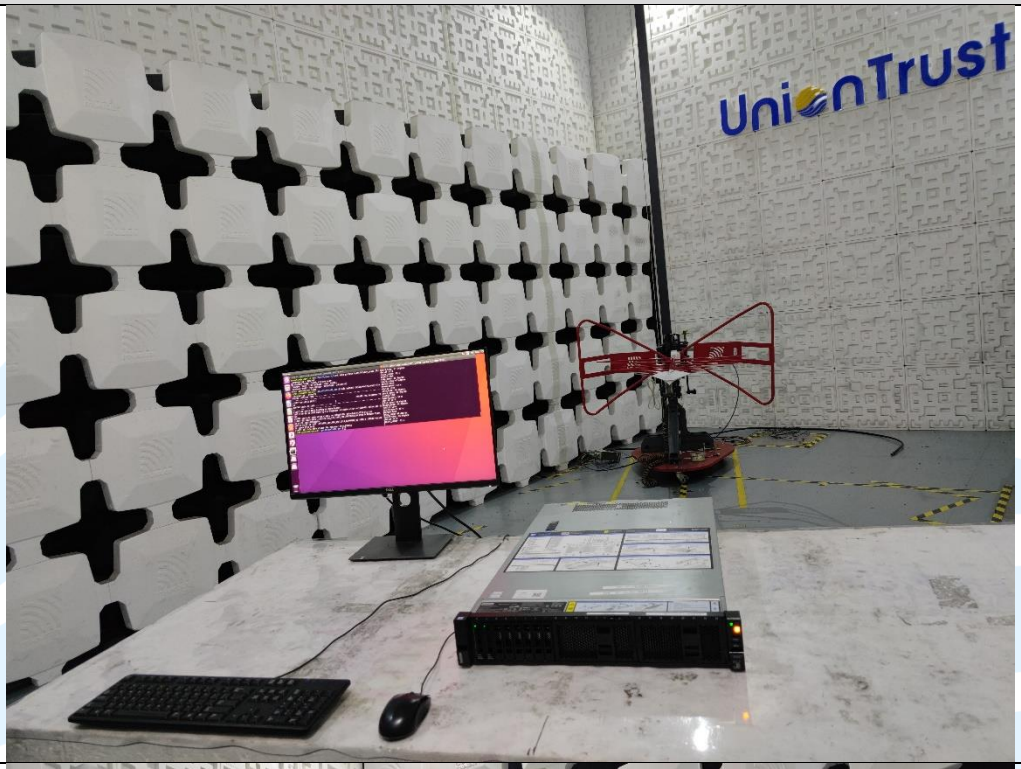


No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.202	30.63	9.74	40.37	53.53	-13.16	Average
2	0.202	34.63	9.74	44.37	63.53	-19.16	QP
3	0.550	14.60	9.79	24.39	46.00	-21.61	Average
4	0.550	25.60	9.79	35.39	56.00	-20.61	QP
5	1.274	22.95	9.86	32.81	46.00	-13.19	Average
6	1.274	32.95	9.86	42.81	56.00	-13.19	QP
7	2.406	15.42	9.97	25.39	46.00	-20.61	Average
8	2.406	25.42	9.97	35.39	56.00	-20.61	QP
9	6.990	4.06	10.24	14.30	50.00	-35.70	Average
10	6.990	16.06	10.24	26.30	60.00	-33.70	QP
11	15.297	25.17	10.49	35.66	50.00	-14.34	Average
12	15.297	37.17	10.49	47.66	60.00	-12.34	QP

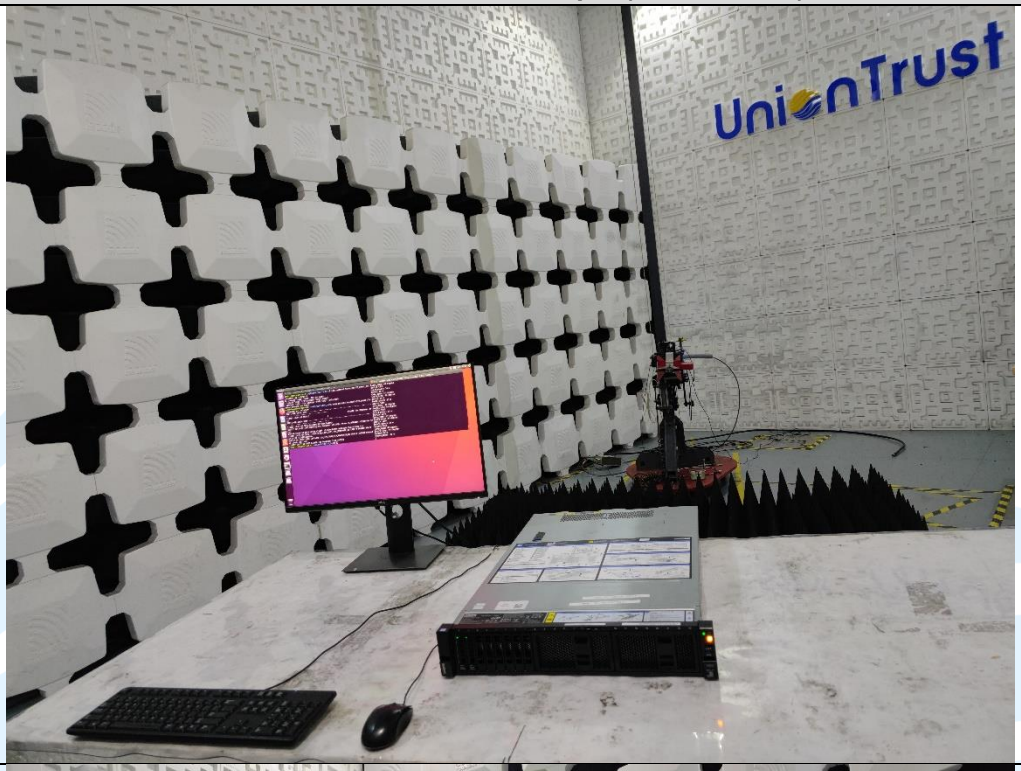
Remark:

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.

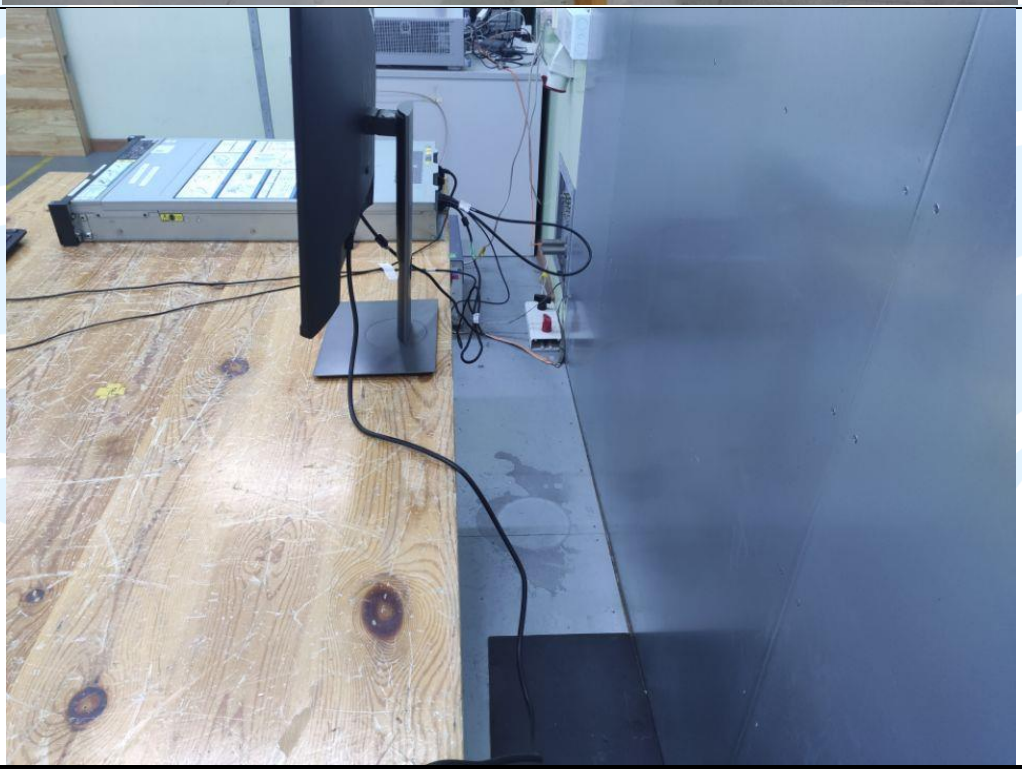
APPENDIX 1 PHOTOS OF TEST SETUP

Radiated emission Test Setup-1 (30 MHz~1 GHz)


Radiated emission Test Setup-2 (Above 1 GHz)



Conducted Emission Test Setup-3



********** End of Report **********

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