Report No.:	FC191129E10
FCC ID:	RRKC4000LG
Test Model:	C4000LG
Received Date:	Nov. 29, 2019
Test Date:	Dec. 02 to 04, 2019
Issued Date:	Dec. 30, 2019
Applicant:	Alpha Networks Inc.
Address:	No.8 Li-shing 7th Rd., Science-based Industrial Park, Hsinchu, Taiwan, R.O.C.
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
Test Location (1):	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
Test Location (2):	No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan
FCC Registration / Designation Number:	810758 / TW1085 for Test Location (1) / 960022 / TW1058 for Test Location (2)

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The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
FC191129E10	Original release.	Dec. 30, 2019

1 Certificate of Conformity

Product:	VDSL2 integrated access device (IAD)
Brand:	CenturyLink
Test Model:	C4000LG
Sample Status:	ENGINEERING SAMPLE
Applicant:	Alpha Networks Inc.
Test Date:	Dec. 02 to 04, 2019
Standards:	47 CFR FCC Part 15:2018, Subpart B, Class B ICES-003:2016 Issue 6, Class B ANSI C63.4:2014

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : Phoenix Huang , **Date:** Dec. 30, 2019

Phoenix Huang / Specialist

Approved by : Tony Chen , **Date:** Dec. 30, 2019

Tony Chen / Senior Porject Engineer

2 Summary of Test Results

47 CFR FCC Part 15:2018, Subpart B / ICES-003:2016 Issue 6, Class B ANSI C63.4:2014				
FCC Clause	ICES-003 Clause	Test Item	Result/Remarks	Verdict
15.107	6.1	AC Power Line Conducted Emissions	Minimum passing Class B margin is -11.18 dB at 0.36484 MHz	Pass
15.109	6.2.1	Radiated Emissions up to 1 GHz	Minimum passing Class B margin is -3.41 dB at 129.11 MHz	Pass
	6.2.2	Radiated Emissions above 1 GHz	Minimum passing Class B margin is -5.96 dB at 1020.01 MHz	Pass

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.8 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	4.0 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	4.7 dB
	6GHz ~ 18GHz	5.2 dB
	18GHz ~ 40GHz	5.3 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 Description of EUT

Product	VDSL2 integrated access device (IAD)
Brand	CenturyLink
Test Model	C4000LG
Sample Status	ENGINEERING SAMPLE
Operating Software	NA
Power Supply Rating	12Vdc from power adapter
Accessory Device	NA
Data Cable Supplied	Refer to Note

Note:

1. Simultaneously transmission condition.

Condition	Technology	
1	WLAN (2.4GHz)	WLAN (5GHz)

2. The antennas provided to the EUT, please refer to the following table:

Frequency Range (GHz)	Directional Antenna Gain (dBi)	Antenna Type	Antenna Connector
2.4 ~ 2.5	5.1	PCB	i-pex(MHF)
5.15 ~ 5.25	6.3		
5.25 ~ 5.35	7.6		
5.47 ~ 5.725	6.4		
5.725 ~ 5.85	7.1		
Note: More detailed information, please refer to antenna specification.			

3. The EUT must be supplied with a power adapter as following table:

No.	Brand	Model No.	Spec.	Plug
1	Asian Power Devices Inc	WA-30P12FU	AC Input: 100-240Vac, 0.9A, 50-60Hz DC Output: 12V, 2.5A DC Output Cable: 1.83m, Unshielded	US
2	LEADER ELECTRONICS INC.	ML30B1120250-A1	AC Input: 100-120Vac, 0.8A, 50/60Hz DC Output: 12V, 2.5A DC Output Cable: 1.83m, Unshielded	US

4. The EUT contains following data cable.

Product	Brand	Color	Quantity	Remark
RJ45 Cable	Nien-Yi/Hunter	Yellow	1	1.83M, unshielded
		White	1	1.83M, unshielded
RJ14 Cable		Green	1	3.66M, unshielded

5. The EUT incorporates a MIMO function:

2.4GHz Band		
MODULATION MODE	**TX & RX CONFIGURATION**	
802.11b	1TX (Fixed Chain 0)	2RX
802.11g	2TX	2RX
802.11n (HT20)	2TX	2RX
802.11n (HT40)	2TX	2RX
VHT20	2TX	2RX
VHT40	2TX	2RX
802.11ax (HE20)	2TX	2RX
802.11ax (HE40)	2TX	2RX
5GHz Band		
MODULATION MODE	**TX & RX CONFIGURATION**	
802.11a	2TX	2RX
802.11n (HT20)	2TX	2RX
802.11n (HT40)	2TX	2RX
802.11ac (VHT20)	2TX	2RX
802.11ac (VHT40)	2TX	2RX
802.11ac (VHT80)	2TX	2RX
802.11ax (HE20)	2TX	2RX
802.11ax (HE40)	2TX	2RX
802.11ax (HE80)	2TX	2RX
Note: All of modulation mode support beamforming function except 802.11a/b/g modulation mode.		

3.2 Features of EUT

The tests reported herein were performed according to the method specified by Alpha Networks Inc., for detailed feature description, please refer to the manufacturer's specifications or user's manual.

3.3 Operating Modes of EUT and Determination of Worst Case Operating Mode

For Radiated emission test, the EUT has been pre-tested under following test modes, and test mode A was the worst case for final test.

Pre-test Mode	Test Condition						
	Adapter Model	Ethernet	LAN/WAN	DSL	RJ45 Brand	RJ14 Brand	Arrangement
Mode A	**WA-30P12FU**	**1000Mbps**	**1000Mbps**	**Link**	**Nien-Yi (white)**	**Nien-Yi**	**Vertical Placement**
Mode B	WA-30P12FU	1000Mbps	1000Mbps	Link	Nien-Yi (yellow)	Nien-Yi	Vertical Placement
Mode C	WA-30P12FU	1000Mbps	1000Mbps	Link	Hinter (white)	Hinter	Vertical Placement
Mode D	WA-30P12FU	1000Mbps	1000Mbps	Link	Hinter (yellow)	Hinter	Vertical Placement
Mode E	ML30B1120250-A1	1000Mbps	1000Mbps	Link	Nien-Yi (white)	Nien-Yi	Vertical Placement
Mode F	WA-30P12FU	100Mbps	100Mbps	Link	Nien-Yi (white)	Nien-Yi	Vertical Placement
Mode G	WA-30P12FU	10Mbps	10Mbps	Link	Nien-Yi (white)	Nien-Yi	Vertical Placement

Note: The test configurations are defined by the applicant requirement.

Test modes are presented in the report as below.

Test Mode	Test Condition						
	Conducted emission test						
	Adapter Model	Ethernet	LAN/WAN	DSL	RJ45 Brand	RJ14 Brand	Arrangement
Mode 1	WA-30P12FU	1000Mbps	1000Mbps	Link	Nien-Yi(white)	Nien-Yi	Vertical Placement
Mode 2	ML30B1120250-A1	1000Mbps	1000Mbps	Link	Nien-Yi(white)	Nien-Yi	Vertical Placement
Test Mode	Test Condition						
	Radiated emission test						
	Adapter Model	Ethernet	LAN/WAN	DSL	RJ45 Brand	RJ14 Brand	Arrangement
Mode 1	WA-30P12FU	1000Mbps	1000Mbps	Link	Nien-Yi (white)	Nien-Yi	Vertical Placement

3.4 Test Program Used and Operation Descriptions

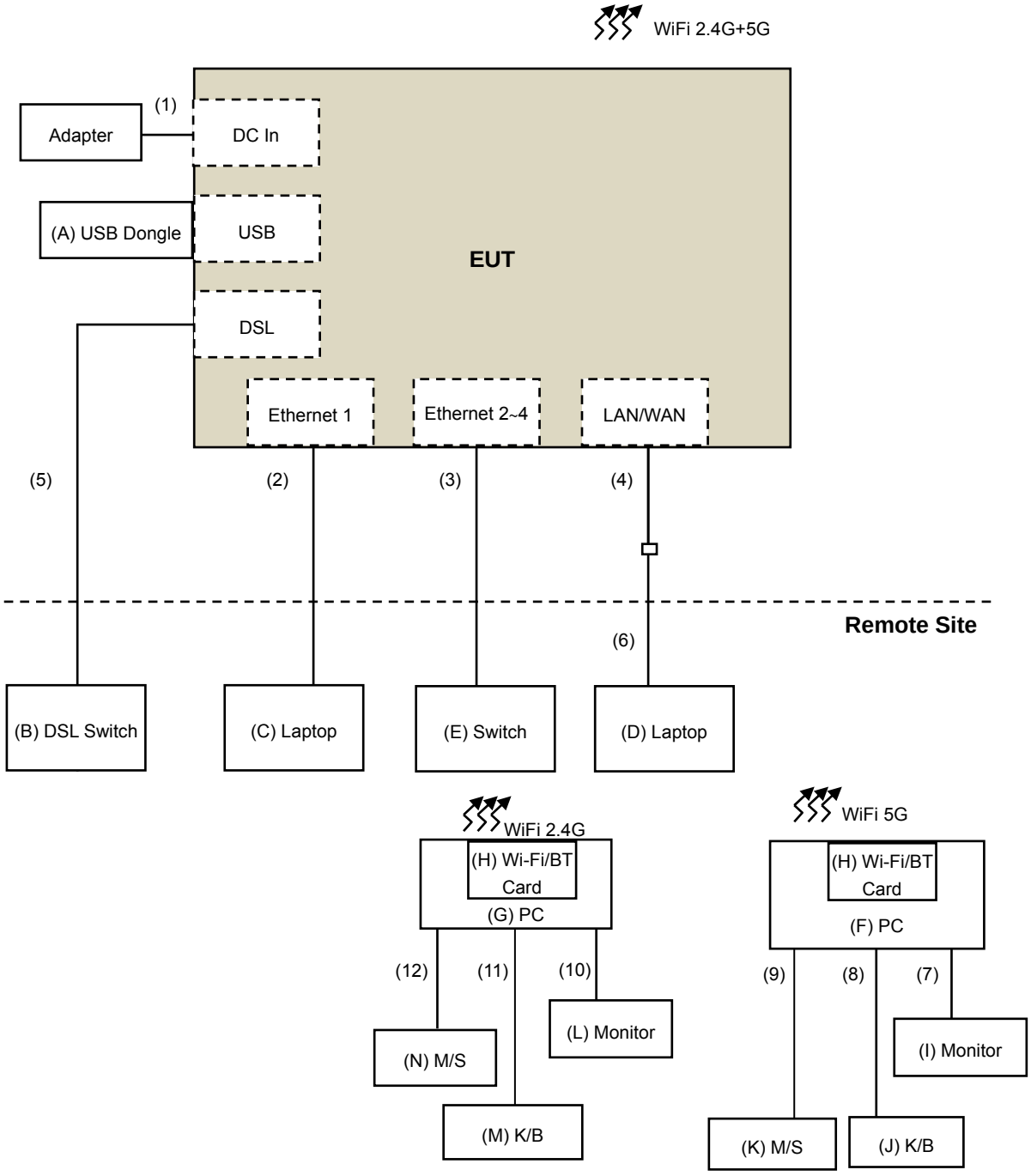
1. Turn on the power of all equipment.
2. Support units C & D (Laptop) run “Ping.exe” program to communicate with EUT via UTP cables.
3. Support units F & G (PC) run “Ping.exe” program to communicate with EUT via wireless.
4. Support unit B (DSL Switch) link with EUT via RJ14 cable.
5. Support unit C (Laptop) reads and writes messages from support unit A (USB Dongle).

3.5 Primary Clock Frequencies of Internal Source

The EUT is provided by Alpha Networks Inc., for detailed internal source, please refer to the manufacturer's specifications.

4 Configuration and Connections with EUT

4.1 Connection Diagram of EUT and Peripheral Devices



4.2 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	USB Dongle	SanDisk	NA	NA	NA	Provided by Lab
B.	DSL Switch	D-LINK	DAS-3626	NA	NA	Supplied by client
C.	Laptop	DELL	PP27L	7YLB32S	FCC DoC	Provided by Lab
D.	Laptop	DELL	PP32LA	HSLB32S	FCC DoC	Provided by Lab
E.	Switch	AboCom	WR5525	WR96002928	FCC DoC	Provided by Lab
F.	PC	Dell	D16M	CN1C172	PPD-QCWB335	Provided by Lab
G.	PC	Dell	D16M	DP9RG62	PPD-QCWB335	Provided by Lab
H.	2*2 802.11ax 160MHz Dual Band WIFI+BLUETOOTH 5 PCIe Card	AORUS	GC-WBAX200	NA	NA	Provided by Lab
I.	Monitor	DELL	E228WFPc	CN-OX765G-64180-86Q-OJTL-AOO	FCC DoC	Provided by Lab
J.	K/B	DELL	SK-8115	MY-0DJ325-71619-99B-0479	FCC DoC	Provided by Lab
K.	M/S	DELL	MOC5UO	I1401ML5	FCC DoC	Provided by Lab
L.	Monitor	DELL	E228WFPc	CN-OX765G-64180-86Q-OJTL-AOO	FCC DoC	Provided by Lab
M.	K/B	DELL	SK-8115	MY-0DJ325-71619-99B-0472	FCC DoC	Provided by Lab
N.	M/S	DELL	MOC5UO	I1401MMP	FCC DoC	Provided by Lab

Note:

1. All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC Cable	1	1.83	No	0	Supplied by client
2.	Cat.5e Cable	1	10	No	0	Provided by Lab
3.	Cat.5e Cable	3	10	No	0	Provided by Lab
4.	Cat.5e Cable	1	1.83	No	0	Supplied by client
5.	RJ14 Cable	1	3.66	No	0	Supplied by client
6.	Cat.5e Cable	1	10	No	0	Provided by Lab
7.	VGA Cable	1	1.8	Yes	0	Provided by Lab
8.	USB Cable	1	1.8	Yes	0	Provided by Lab
9.	USB Cable	1	1.8	Yes	0	Provided by Lab
10.	VGA Cable	1	1.8	Yes	0	Provided by Lab
11.	USB Cable	1	1.8	Yes	0	Provided by Lab
12.	USB Cable	1	1.8	Yes	0	Provided by Lab

5 Conducted Emissions at Mains Ports

5.1 Limits

Frequency (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

Notes: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

5.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	100375	May 15, 2019	May 14, 2020
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK-8127	8127-522	Sep. 04, 2019	Sep. 03, 2020
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV 216	100072	June 12, 2019	June 11, 2020
RF Cable	5D-FB	COACAB-001	Mar. 14, 2019	Mar. 13, 2020
10 dB PAD EMEC	STI02-2200-10	004	Mar. 14, 2019	Mar. 13, 2020
50 ohms Terminator	N/A	EMC-03	Sep. 25, 2019	Sep. 24, 2020
50 ohms Terminator	N/A	EMC-02	Sep. 25, 2019	Sep. 24, 2020
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conducted Room C
3 The VCCI Con C Registration No. is C-13611.
4 Tested Date: Dec. 02, 2019

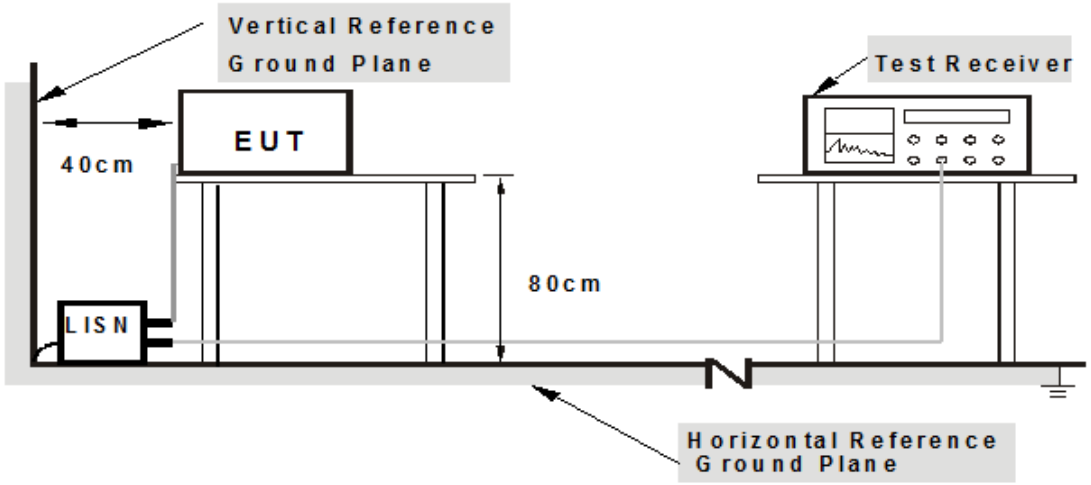
5.3 Test Arrangement

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

c. The test results of conducted emissions at mains ports are recorded of six worst margins for quasi-peak (mandatory) [and average (if necessary)] values against the limits at frequencies of interest unless the margin is 20 dB or greater.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.



Note: 1.Support units were connected to second LISN.

5.4 Supplementary Information

There is not any deviation from the test standards for the test method.

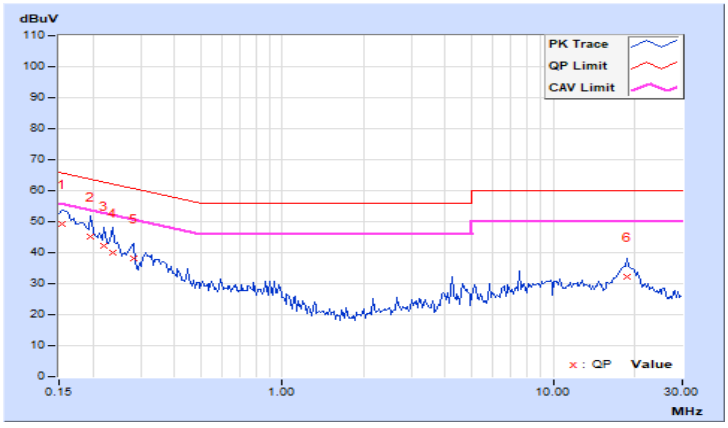
5.5 Test Results (Mode 1)

Frequency Range	150kHz ~ 30MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	**Environmental Conditions**	24℃, 64%RH
Tested by	Jason Huang		
Test Mode	Mode 1		

Phase Of Power : Line (L)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.15391	10.07	39.15	25.05	49.22	35.12	65.79	55.79	-16.57	-20.67
2	0.19687	10.08	35.05	21.88	45.13	31.96	63.74	53.74	-18.61	-21.78
3	0.22031	10.08	32.04	18.85	42.12	28.93	62.81	52.81	-20.69	-23.88
4	0.23594	10.09	29.83	20.67	39.92	30.76	62.24	52.24	-22.32	-21.48
5	0.28281	10.09	28.09	15.76	38.18	25.85	60.73	50.73	-22.55	-24.88
6	18.78516	10.97	21.11	16.09	32.08	27.06	60.00	50.00	-27.92	-22.94

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

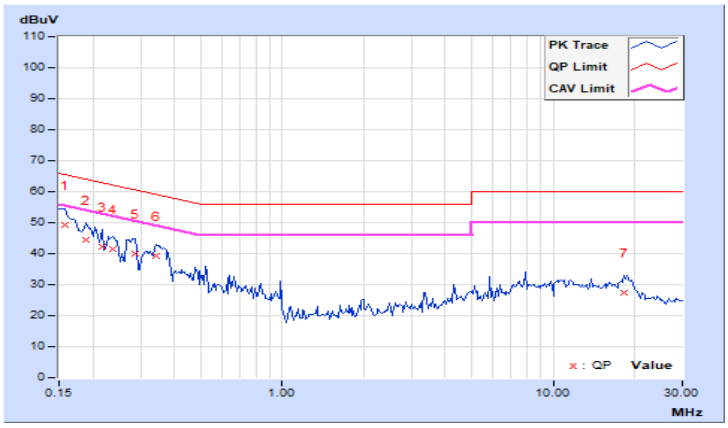


Frequency Range	150kHz ~ 30MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	**Environmental Conditions**	24℃, 64%RH
Tested by	Jason Huang		
Test Mode	Mode 1		

Phase Of Power : Neutral (N)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.15781	10.10	38.99	25.55	49.09	35.65	65.58	55.58	-16.49	-19.93
2	0.18906	10.10	34.18	22.21	44.28	32.31	64.08	54.08	-19.80	-21.77
3	0.21641	10.10	32.06	23.73	42.16	33.83	62.96	52.96	-20.80	-19.13
4	0.23594	10.11	31.46	23.24	41.57	33.35	62.24	52.24	-20.67	-18.89
5	0.28672	10.11	29.90	18.41	40.01	28.52	60.62	50.62	-20.61	-22.10
6	0.34141	10.12	29.01	18.47	39.13	28.59	59.17	49.17	-20.04	-20.58
7	18.30469	11.01	16.47	15.68	27.48	26.69	60.00	50.00	-32.52	-23.31

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



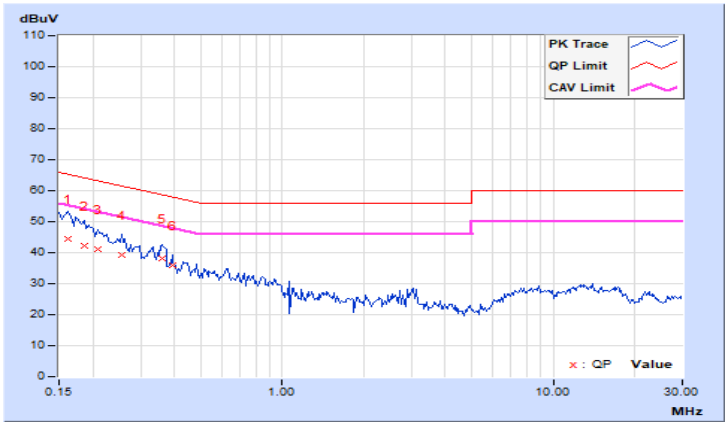
5.6 Test Results (Mode 2)

Frequency Range	150kHz ~ 30MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	**Environmental Conditions**	24℃, 64%RH
Tested by	Jason Huang		
Test Mode	Mode 2		

Phase Of Power : Line (L)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.16172	10.07	34.34	20.92	44.41	30.99	65.38	55.38	-20.97	-24.39
2	0.18516	10.08	32.20	25.57	42.28	35.65	64.25	54.25	-21.97	-18.60
3	0.20859	10.08	31.11	21.53	41.19	31.61	63.26	53.26	-22.07	-21.65
4	0.25547	10.09	29.27	24.75	39.36	34.84	61.58	51.58	-22.22	-16.74
5	0.36094	10.10	28.20	25.74	38.30	35.84	58.71	48.71	-20.41	-12.87
6	0.39219	10.11	25.99	20.28	36.10	30.39	58.02	48.02	-21.92	-17.63

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

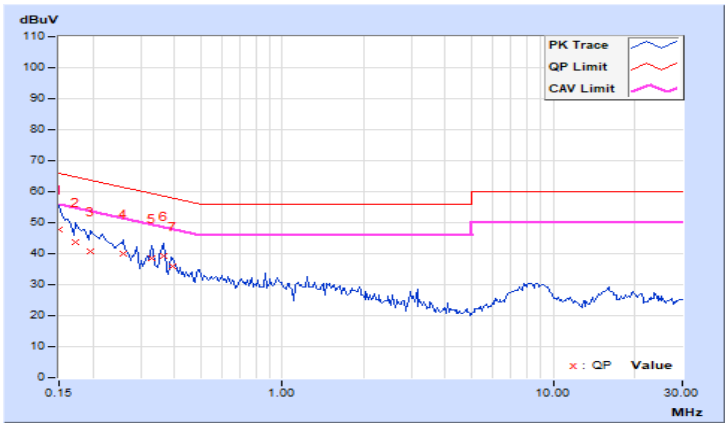


Frequency Range	150kHz ~ 30MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	**Environmental Conditions**	24℃, 64%RH
Tested by	Jason Huang		
Test Mode	Mode 2		

Phase Of Power : Neutral (N)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.15000	10.10	37.53	28.81	47.63	38.91	66.00	56.00	-18.37	-17.09
2	0.17344	10.10	33.58	23.25	43.68	33.35	64.79	54.79	-21.11	-21.44
3	0.19687	10.10	30.82	18.29	40.92	28.39	63.74	53.74	-22.82	-25.35
4	0.25938	10.11	30.07	23.15	40.18	33.26	61.45	51.45	-21.27	-18.19
5	0.32969	10.12	28.28	24.52	38.40	34.64	59.46	49.46	-21.06	-14.82
6	**0.36484**	**10.12**	**29.22**	**27.32**	**39.34**	**37.44**	**58.62**	**48.62**	**-19.28**	**-11.18**
7	0.39219	10.13	25.71	16.76	35.84	26.89	58.02	48.02	-22.18	-21.13

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



6 Radiated Emissions up to 1 GHz

6.1 Limits

Emissions radiated outside of the specified bands, shall be according to the general radiated limits as following:

Radiated Emissions Limits at 10 meters (dBμV/m)				
Frequencies (MHz)	FCC 15B / ICES-003, Class A	FCC 15B / ICES-003, Class B	CISPR 22, Class A	CISPR 22, Class B
30-88	39	29.5	40	30
88-216	43.5	33.1		
216-230	46.4	35.6		
230-960			47	37
960-1000	49.5	43.5		

Radiated Emissions Limits at 3 meters (dBμV/m)				
Frequencies (MHz)	FCC 15B / ICES-003, Class A	FCC 15B / ICES-003, Class B	CISPR 22, Class A	CISPR 22, Class B
30-88	49.5	40	50.5	40.5
88-216	54	43.5		
216-230	56.9	46		
230-960			57.5	47.5
960-1000	60	54		

Notes: 1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. QP detector shall be applied if not specified.

6.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010125	Apr. 11, 2019	Apr. 10, 2020
Test Receiver Agilent	N9038A	MY50010132	July 12, 2019	July 11, 2020
Pre-Amplifier Sonoma	310N	352925	Aug. 26, 2019	Aug. 25, 2020
	310N	352926	Aug. 26, 2019	Aug. 25, 2020
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-359	Nov. 11, 2019	Nov. 10, 2020
	VULB 9168	9168-358	Nov. 08, 2019	Nov. 07, 2020
Fixed attenuator Mini-Circuits	UNAT-5+	CHF-001	Sep. 04, 2019	Sep. 03, 2020
	UNAT-5+	CHF-002	Sep. 04, 2019	Sep. 03, 2020
RF Cable	8D-FB	CHFCAB-001-1 CHFCAB-001-3 CHFCAB-001-4	Sep. 16, 2019	Sep. 15, 2020
		CHFCAB-002-1 CHFCAB-002-3 CHFCAB-002-4	Sep. 16, 2019	Sep. 15, 2020
Software BVADT	ADT_Radiated_V 8.7.08	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA

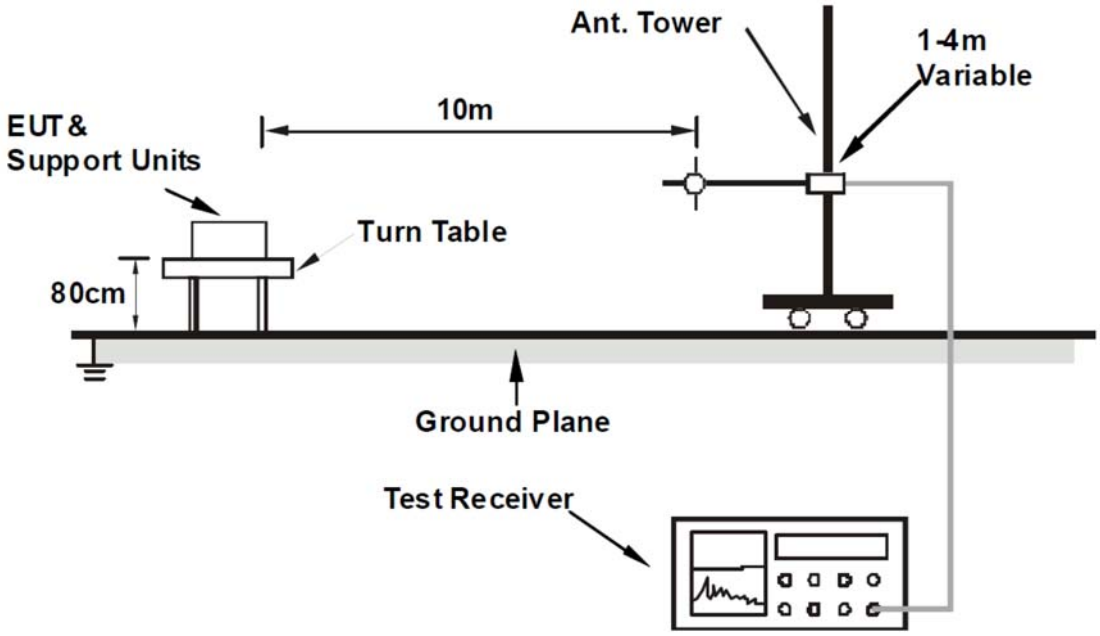
Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Chamber F room
3. The VCCI Site Registration No. is R-13252.
4. Tested Date: Dec. 04, 2019

6.3 Test Arrangement

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited test facility. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is up to 1 GHz.

Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for quasi-peak detection (QP) at frequency up to 1GHz.



For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

6.4 Supplementary Information

There is not any deviation from the test standards for the test method.

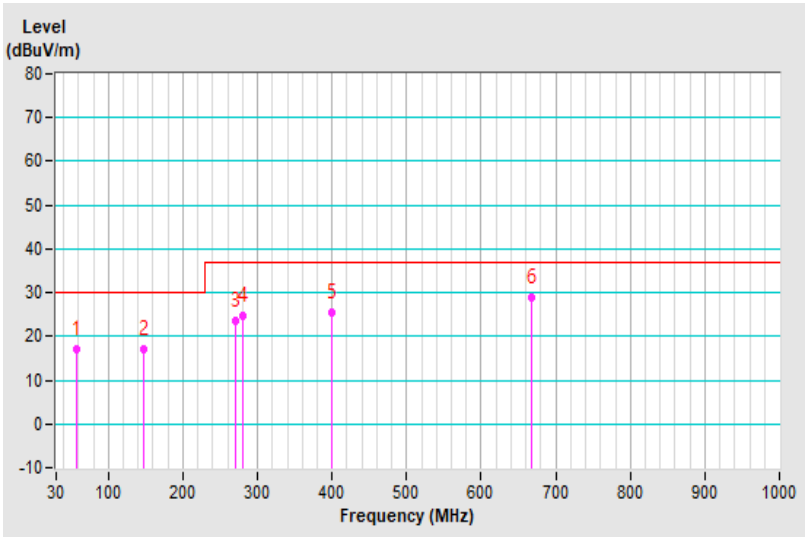
6.5 Test Results

Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	120Vac, 60Hz	Environmental Conditions	23℃, 62%RH
Tested by	Darren Lin		
Test Mode	Mode 1		

Antenna Polarity & Test Distance : Horizontal at 10 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	57.31	17.22 QP	30.00	-12.78	4.00 H	210	30.38	-13.16
2	146.79	17.21 QP	30.00	-12.79	3.00 H	233	29.12	-11.91
3	271.51	23.50 QP	37.00	-13.50	3.00 H	41	35.32	-11.82
4	280.77	24.59 QP	37.00	-12.41	3.00 H	14	36.09	-11.50
5	398.72	25.45 QP	37.00	-11.55	2.00 H	130	33.85	-8.40
6	666.66	28.94 QP	37.00	-8.06	3.90 H	92	31.06	-2.12

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

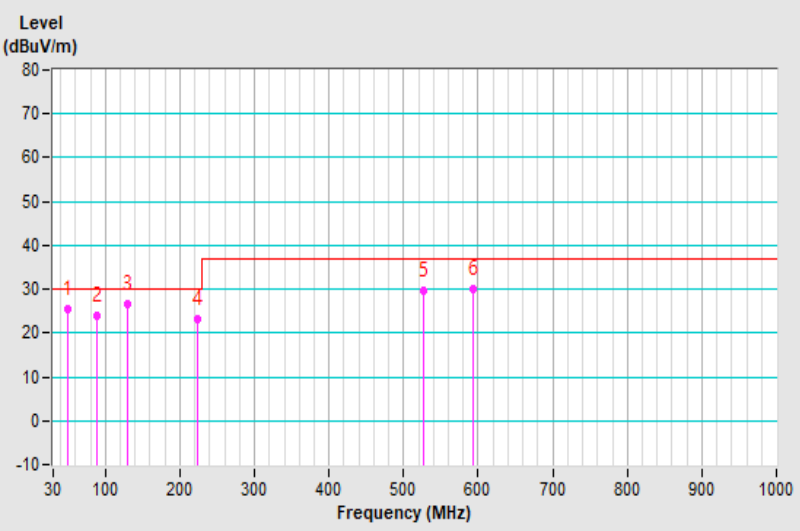


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	120Vac, 60Hz	Environmental Conditions	23℃, 62%RH
Tested by	Darren Lin		
Test Mode	Mode 1		

Antenna Polarity & Test Distance : Vertical at 10 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	49.13	25.52 QP	30.00	-4.48	3.00 V	143	37.97	-12.45
2	89.02	24.01 QP	30.00	-5.99	2.00 V	8	42.17	-18.16
3	**129.11**	**26.59 QP**	**30.00**	**-3.41**	**1.12 V**	**199**	**39.81**	**-13.22**
4	223.08	23.22 QP	30.00	-6.78	1.00 V	142	38.24	-15.02
5	527.27	29.59 QP	37.00	-7.41	1.00 V	170	34.44	-4.85
6	594.01	30.07 QP	37.00	-6.93	3.00 V	279	33.13	-3.06

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value



7 Radiated Emissions above 1 GHz

7.1 Limits

Emissions radiated outside of the specified bands, shall be according to the general radiated limits as following:

Radiated Emissions Limits at 10 meters (dBμV/m)				
Frequencies (MHz)	FCC 15B / ICES-003, Class A	FCC 15B / ICES-003, Class B	CISPR 22, Class A	CISPR 22, Class B
1000-3000	Avg: 49.5 Peak: 69.5	Avg: 43.5 Peak: 63.5	Not defined	Not defined
Above 3000			Not defined	Not defined

Radiated Emissions Limits at 3 meters (dBμV/m)				
Frequencies (MHz)	FCC 15B / ICES-003, Class A	FCC 15B / ICES-003, Class B	CISPR 22, Class A	CISPR 22, Class B
1000-3000	Avg: 60 Peak: 80	Avg: 54 Peak: 74	Avg: 56 Peak: 76	Avg: 50 Peak: 70
Above 3000			Avg: 60 Peak: 80	Avg: 54 Peak: 74

Notes:
1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, 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 20dB under any condition of modulation.

Frequency Range (For unintentional radiators)

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 40GHz, whichever is lower

7.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010125	Apr. 11, 2019	Apr. 10, 2020
Pre-Amplifier Agilent	8449B	3008A01975	Feb. 21, 2019	Feb. 20, 2020
Horn Antenna SCHWARZBECK	BBHA 9120D	D123	Nov. 24, 2019	Nov. 23, 2020
RF Coaxial Cable	EMC104-SM-SM -11000	170209	Mar. 05, 2019	Mar. 04, 2020
RF Coaxial Cable	EMC104-SM-SM -6000	170207	Mar. 05, 2019	Mar. 04, 2020
RF Coaxial Cable	EMC104-SM-SM -2500	170206	Mar. 05, 2019	Mar. 04, 2020
Spectrum Analyzer Agilent	E4446A	MY48250254	Nov. 20, 2019	Nov. 19, 2020
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Dec. 04, 2018	Dec. 03, 2019
Horn Antenna SCHWARZBECK	BBHA 9170	9170-424	Nov. 24, 2019	Nov. 23, 2020
RF Cable	SUCOFLEX 102	36432/2 36443/2	Jan. 10, 2019	Jan. 09, 2020
Software BVADT	ADT_Radiated_ V8.7.08	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA
Fix tool for Boresight antenna tower	BAF-01	5	NA	NA

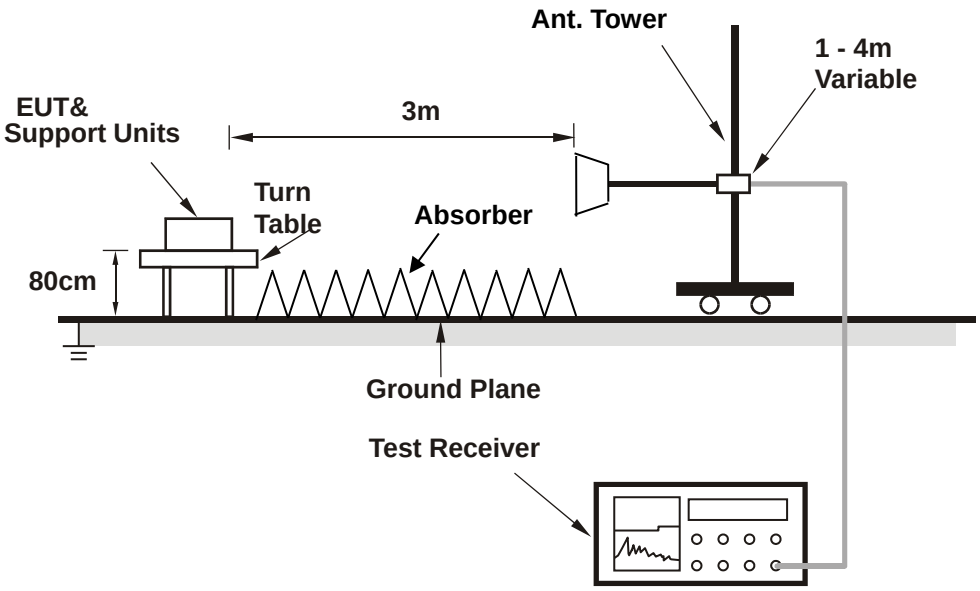
Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Chamber F room
3. Tested Date: Dec. 03, 2019

7.3 Test Arrangement

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The height of antenna can be varied from one meter to four meters, the height of adjustment depends on the EUT height and the antenna 3dB beamwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The spectrum analyzer system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

Note: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection (PK) at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.



The test arrangement is in accordance with ANSI 63.4:2014. For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.4 Supplementary Information

There is not any deviation from the test standards for the test method.

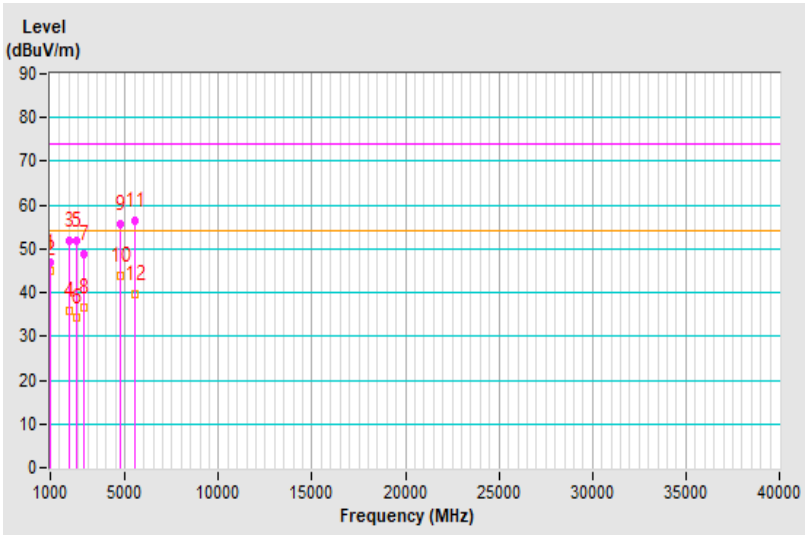
7.5 Test Results

Frequency Range	1GHz ~ 29.25GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	120Vac, 60Hz	Environmental Conditions	25℃, 71%RH
Tested by	Jason Huang		
Test Mode	Mode 1		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1020.01	47.04 PK	74.00	-26.96	1.00 H	95	54.60	-7.56
2	1020.01	45.16 AV	54.00	-8.84	1.00 H	107	52.72	-7.56
3	2045.50	51.70 PK	74.00	-22.30	1.00 H	10	51.23	0.47
4	2045.50	35.66 AV	54.00	-18.34	1.00 H	15	35.19	0.47
5	2429.70	51.90 PK	74.00	-22.10	2.00 H	79	51.02	0.88
6	2429.70	34.17 AV	54.00	-19.83	2.00 H	80	33.29	0.88
7	2817.30	48.74 PK	74.00	-25.26	1.00 H	217	45.19	3.55
8	2817.30	36.70 AV	54.00	-17.30	1.00 H	222	33.15	3.55
9	4777.40	55.53 PK	74.00	-18.47	1.00 H	319	41.05	14.48
10	4777.40	43.82 AV	54.00	-10.18	1.00 H	321	29.34	14.48
11	5501.60	56.48 PK	74.00	-17.52	2.00 H	340	44.81	11.67
12	5501.60	39.69 AV	54.00	-14.31	2.00 H	345	28.02	11.67

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

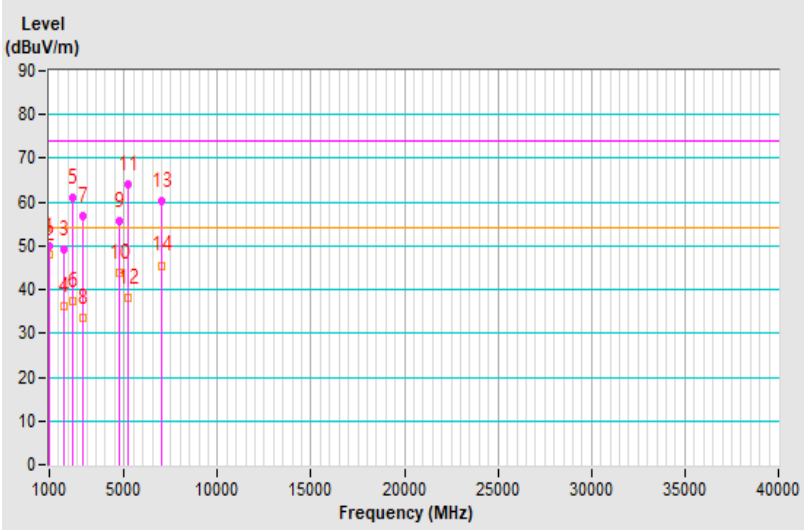


Frequency Range	1GHz ~ 29.25GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	120Vac, 60Hz	Environmental Conditions	25℃, 71%RH
Tested by	Jason Huang		
Test Mode	Mode 1		

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1020.01	49.80 PK	74.00	-24.20	1.00 V	188	57.36	-7.56
2	**1020.01**	**48.04 AV**	**54.00**	**-5.96**	**1.00 V**	**187**	**55.60**	**-7.56**
3	1815.02	49.15 PK	74.00	-24.85	1.00 V	172	51.01	-1.86
4	1815.02	36.15 AV	54.00	-17.85	1.00 V	168	38.01	-1.86
5	2274.15	61.00 PK	74.00	-13.00	1.00 V	37	57.64	3.36
6	2274.15	37.23 AV	54.00	-16.77	1.00 V	35	33.87	3.36
7	2818.15	56.79 PK	74.00	-17.21	2.00 V	37	53.25	3.54
8	2818.15	33.65 AV	54.00	-20.35	2.00 V	45	30.11	3.54
9	4758.70	55.82 PK	74.00	-18.18	1.00 V	80	42.19	13.63
10	4758.70	43.69 AV	54.00	-10.31	1.00 V	82	30.06	13.63
11	5176.90	64.01 PK	74.00	-9.99	1.00 V	252	54.17	9.84
12	5176.90	38.02 AV	54.00	-15.98	1.00 V	253	28.18	9.84
13	7021.40	60.28 PK	74.00	-13.72	1.00 V	32	41.88	18.40
14	7021.40	45.55 AV	54.00	-8.45	1.00 V	36	27.15	18.40

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value



8 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Lin Kou EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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