

FCC Test Report

Report No.: FD190318D03

Model No.: PA311D-BK

Received Date: Mar. 18, 2019

Test Date: Mar. 20 to 21, 2019

Issued Date: Mar. 28, 2019

Applicant: TOP VICTORY ELECTRONICS (TAIWAN) CO., LTD.

Address: 10F., No 230, Liancheng Rd., Zhonghe Dist., New Taipei City 23553, Taiwan

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

**FCC Registration /
Designation Number:** 418586 / TW1078



Certificate #4327.01

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Release Control Record

Issue No.	Description	Date Issued
FD190318D03	Original release.	Mar. 28, 2019

1 Certificate of Conformity

Product: LCD Monitor

Brand: NEC

Model No.: PA311D-BK

Sample Status: Engineering sample

Applicant: TOP VICTORY ELECTRONICS (TAIWAN) CO., LTD.

Test Date: Mar. 20 to 21, 2019

Standards: 47 CFR FCC Part 15, 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 :

Albee Chu

Date: Mar. 28, 2019

Albee Chu / Specialist

Approved by :

Jim Hsiang

Date: Mar. 28, 2019

Jim Hsiang / Associate Technical Manager

2 Summary of Test Results

47 CFR FCC Part 15, 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	Conducted Emissions at mains ports	Minimum passing Class B margin is -11.72 dB at 11.54143 MHz	Pass
15.109	6.2.1	Radiated Emissions up to 1 GHz	Minimum passing Class B margin is -4.05 dB at 836.89 MHz	Pass
	6.2.2	Radiated Emissions above 1 GHz	Minimum passing Class B margin is -4.06 dB at 1036.18 MHz & 1036.16 MHz	Pass

Note:

1. There is no deviation to the applied test methods and requirements covered by the scope of this report.
2. 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	Expended Uncertainty (k=2) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.79 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	3.67 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.13 dB
	Above 6GHz	4.51 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 Description of EUT

Product	LCD Monitor
Brand	NEC
Model No.	PA311D-BK
Sample Status	Engineering sample
Operating Software	N/A
Power Supply Rating	Internal switching power supply Rating: 100-240Vac, 50/60Hz Power Cord: Non-shielded AC 3 Pin (1.8m)
Accessory Device	N/A
Data Cable Supplied	Shielded Display cable (1.8m) Shielded HDMI cable (1.8m) Shielded USB-C cable (1.8m) Shielded USB-B cable (1.8m)

Note:

1. The EUT is a LCD Monitor and it has the following interfaces:

- ◆ SENS/EME
- ◆ Headphone
- ◆ USB-A *3
- ◆ USB-B *2
- ◆ USB-C (up to 4096 x 2160, 60Hz)
- ◆ Display in *2 (up to 4096 x 2160, 60Hz)
- ◆ HDMI in *2 (up to 4096 x 2160, 60Hz)
- ◆ LAN (10/100Mbps)
- ◆ GND
- ◆ AC in

3.2 Features of EUT

The tests reported herein were performed according to the method specified by TOP VICTORY ELECTRONICS (TAIWAN) CO., LTD., 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

1. The EUT has been pre-tested under following test modes, and **Pre-tested Mode 1** was the worst case.

Description		Pre-tested mode											
		1	2	3	4	5	6	7	8	9	10	11	12
Interface/ function	HDMI in: 4096 x 2160 (60Hz) + LAN Ping	V	V	V	V	V							
	DP in: 4096 x 2160 (60Hz) + LAN Ping						V						
	USB-C in: 4096 x 2160 (60Hz) + LAN Ping							V					
	HDMI in: 1920 x 1200 (60Hz) + LAN Ping								V				
	HDMI in: 640 x 480 (60Hz) + LAN Ping									V			
	PIP <HDMI: 4096 x 2160 (60Hz) + HDMI: 4096 x 2160 (60Hz)>										V		
	PBP<HDMI: 4096 x 2160 (60Hz) + HDMI: 4096 x 2160 (60Hz)>											V	
	HDMI from DVD: 2160p												V
Earphone	With	V		V	V	V	V	V	V	V	V	V	V
	Without		V										
Setup of Panel	Horizontal - up	V	V		V	V	V	V	V	V	V	V	V
	Horizontal - down			V									
USB-C function	Display in							V					
	PD	with 5V/3A load	V	V	V		V		V	V	V	V	V
		with 12V/3A load				V							
		with 20V/3.25A load				V							

2. According to pre-test result and client's requirement, the final test modes were as the following:

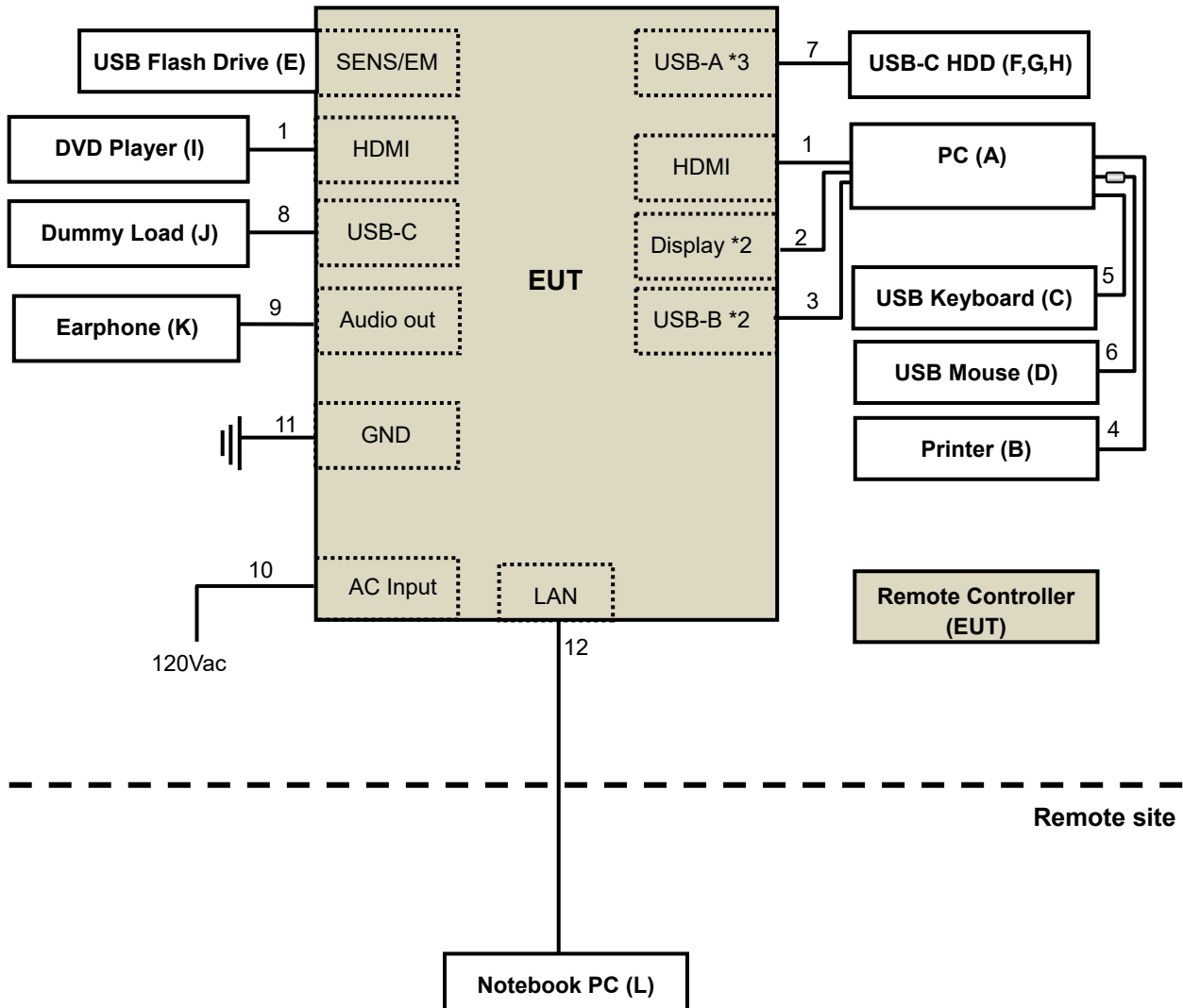
Mode	Test Condition	Input Power
1	Pre-tested Mode 1	120Vac/ 60Hz
2	Pre-tested Mode 12	

3.4 Test Program Used and Operation Descriptions

- Turned on the power of all equipment.
- PC ran a test program to enable all functions.
- PC read and wrote messages from HDD.
- EUT read messages from USB flash drive and ext. HDDs.
- EUT sent and received messages from Notebook PC (kept in a remote area) via an UTP LAN cable (10m).
- PC sent "H" messages to EUT, then it displayed "H" messages on its screen.
- DVD players sent color bars messages to EUT, and then it displayed color bars messages on its screen.
- PC sent messages to printer and printer printed them out.
- EUT discharge to load continuously.
- PC/ DVD players sent "1kHz audio" signal to earphone via EUT.
- Steps c-j were repeated.

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.	PC	HP	Elite Desk 800G4	4CE8451BKY	FCC DoC Approved	Provided by Lab
B.	Printer	HP	SNPRC-1203-01	CN57SCC0F1	B94SDGOB1191	Provided by Lab
C.	USB Keyboard	Dell	KB216t	CN-0W33XP-LO3 00-7CL-191E	FCC DoC Approved	Provided by Lab
D.	USB Mouse	Microsoft	1113	9170515153471	FCC DoC Approved	Provided by Lab
E.	USB 3.0 Flash Drive	HP	v250w	N/A	FCC DoC Approved	Provided by Lab
F.	USB-C Hard Disk	G-DRIVE	0G04878	620XHB8W	FCC DoC Approved	Provided by Lab
G.	USB-C Hard Disk	G-DRIVE	0G04878	620XHEMW	FCC DoC Approved	Provided by Lab
H.	USB-C Hard Disk	G-DRIVE	0G04878	D33TRR7M	FCC DoC Approved	Provided by Lab
I.	DVD PLAYER	SONY	BDP-S470	3200799	Verification	Provided by Lab
J.	DUMMY LOAD	BVADT	L19B	L2-010025	N/A	Provided by Lab
K.	EARPHONE	PHILIPS	SBC HL150	H2010153	N/A	Provided by Lab
L.	Notebook PC	DELL	P41G	HT4W952	FCC DoC Approved	Provided by Lab

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item L acted as communication partners to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	HDMI cable	2	1.8	Y	0	Supplied by client
2.	Display cable	2	1.8	Y	0	Supplied by client
3.	USB-B cable	2	1.8	Y	0	Supplied by client
4.	USB cable	1	1.8	Y	0	Provided by Lab
5.	USB cable	1	1.8	Y	0	Provided by Lab
6.	USB cable	1	1.8	Y	1	Provided by Lab
7.	USB-A to USB-C cable	3	0.5	Y	0	Provided by Lab
8.	USB-C cable	1	1.8	Y	0	Supplied by client
9.	Audio cable	1	1.0	N	0	Provided by Lab
10.	AC power cable	1	1.8	N	0	Supplied by client
11.	GND cable	1	2.0	N	0	Provided by Lab
12.	LAN cable (Cat.5e)	1	10	N	0	Provided by Lab

Note: The core(s) is(are) originally attached to the cable(s).

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.	Cal. Date	Cal. Due
ROHDE & SCHWARZ TEST RECEIVER	ESR3	102414	Jan. 17, 2019	Jan. 16, 2020
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ENV216	101197	May 23, 2018	May 22, 2019
LISN With Adapter (for EUT)	AD10	C10Ada-002	May 23, 2018	May 22, 2019
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	100218	Nov. 30, 2018	Nov. 29, 2019
SCHWARZBECK Artificial Mains Network (For EUT)	NNLK8129	8129229	May 3, 2018	May 2, 2019
SCHWARZBECK Artificial Mains Network (For EUT)	NNLK 8121	8121-808	Mar. 15, 2019	Mar. 14, 2020
Software	Cond_V7.3.7.4	NA	NA	NA
RF cable (JYEBAO) With 10dB PAD	5D-FB	Cable-C10.01	Feb. 13, 2019	Feb. 12, 2020
SUHNTER Terminator (For ROHDE & SCHWARZ LISN)	65BNC-5001	E1-011484	May 8, 2018	May 7, 2019
ROHDE & SCHWARZ Artificial Mains Network (For TV EUT)	ESH3-Z5	100220	Nov. 21, 2018	Nov. 20, 2019
LISN With Adapter (for TV EUT)	100220	NA	Nov. 21, 2018	Nov. 20, 2019

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in Shielded Room No. 10.

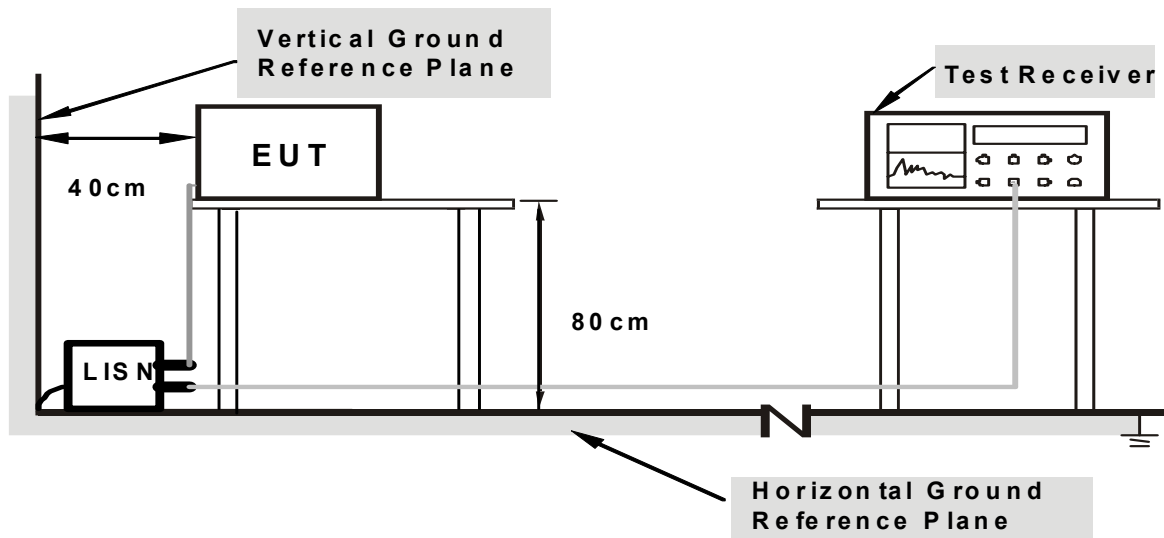
3. The VCCI Site Registration No. C-11852.

4. Tested Date: Mar 21, 2019.

5.3 Test Arrangement

- 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.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- 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: Support units were connected to second LISN.

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

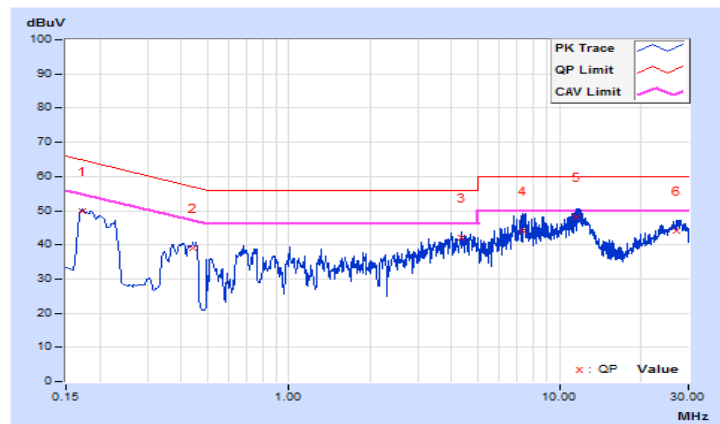
5.4 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 79%RH
Tested by	John Liao		
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	0.17328	9.67	40.21	30.10	49.88	39.77	64.80	54.80	-14.92	-15.03
2	0.44325	9.70	29.30	15.32	39.00	25.02	57.00	47.00	-18.00	-21.98
3	4.37481	9.84	32.10	19.32	41.94	29.16	56.00	46.00	-14.06	-16.84
4	7.31081	9.90	34.23	27.29	44.13	37.19	60.00	50.00	-15.87	-12.81
5	11.54143	9.96	38.20	28.32	48.16	38.28	60.00	50.00	-11.84	-11.72
6	27.09541	10.15	33.96	28.10	44.11	38.25	60.00	50.00	-15.89	-11.75

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

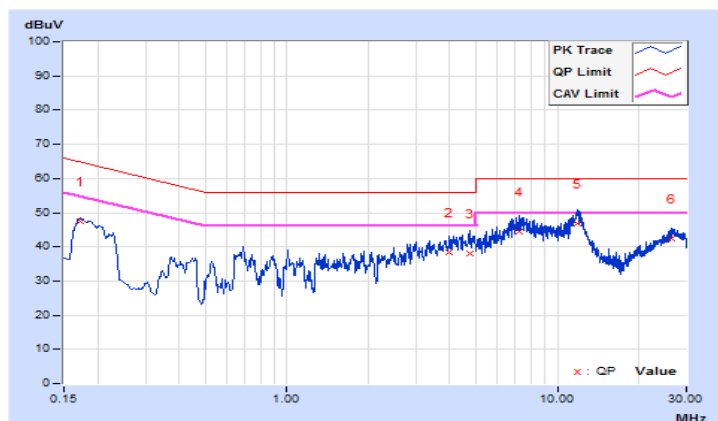


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 79%RH
Tested by	John Liao		
Test Mode	Mode 1		

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	0.17283	9.68	37.85	27.19	47.53	36.87	64.82	54.82	-17.29	-17.95
2	3.97990	9.84	28.63	20.12	38.47	29.96	56.00	46.00	-17.53	-16.04
3	4.73846	9.86	28.30	21.87	38.16	31.73	56.00	46.00	-17.84	-14.27
4	7.20133	9.91	34.52	27.99	44.43	37.90	60.00	50.00	-15.57	-12.10
5	11.91288	9.99	36.95	28.12	46.94	38.11	60.00	50.00	-13.06	-11.89
6	26.54019	10.13	32.22	26.88	42.35	37.01	60.00	50.00	-17.65	-12.99

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

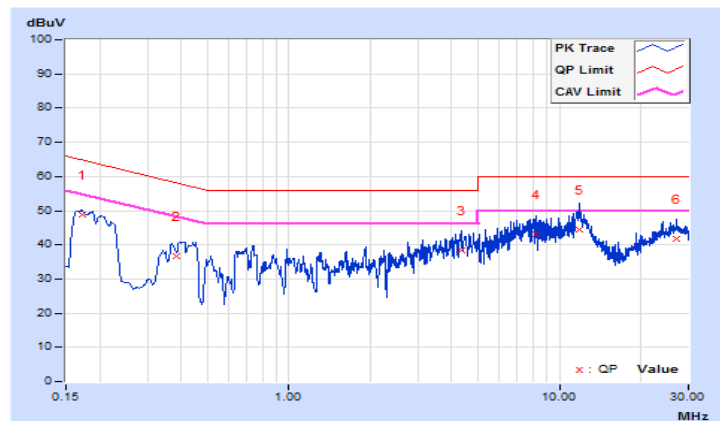


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 79%RH
Tested by	John Liao		
Test Mode	Mode 2		

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	0.17357	9.67	39.06	25.50	48.73	35.17	64.79	54.79	-16.06	-19.62
2	0.38419	9.70	26.95	17.19	36.65	26.89	58.19	48.19	-21.54	-21.30
3	4.36608	9.84	28.59	16.68	38.43	26.52	56.00	46.00	-17.57	-19.48
4	8.19838	9.91	33.26	22.90	43.17	32.81	60.00	50.00	-16.83	-17.19
5	11.86114	9.97	34.60	25.96	44.57	35.93	60.00	50.00	-15.43	-14.07
6	27.18925	10.15	31.54	25.94	41.69	36.09	60.00	50.00	-18.31	-13.91

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

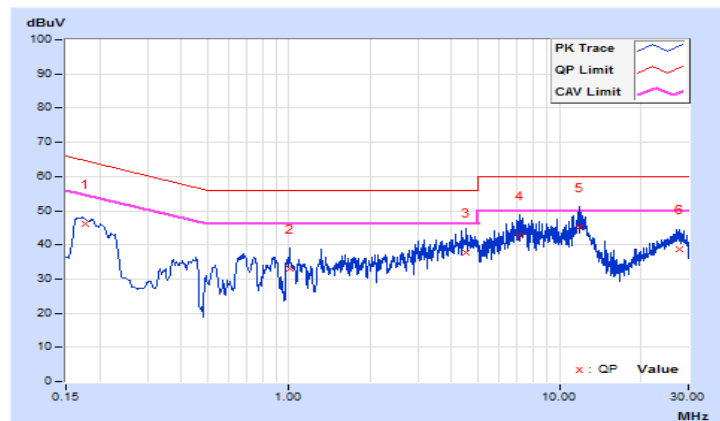


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 79%RH
Tested by	John Liao		
Test Mode	Mode 2		

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	0.17592	9.68	36.37	24.41	46.05	34.09	64.68	54.68	-18.63	-20.59
2	1.00330	9.78	23.35	14.20	33.13	23.98	56.00	46.00	-22.87	-22.02
3	4.53821	9.85	27.86	18.83	37.71	28.68	56.00	46.00	-18.29	-17.32
4	7.17105	9.91	32.91	24.72	42.82	34.63	60.00	50.00	-17.18	-15.37
5	11.88942	9.99	35.11	26.66	45.10	36.65	60.00	50.00	-14.90	-13.35
6	27.63890	10.14	28.52	23.04	38.66	33.18	60.00	50.00	-21.34	-16.82

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 (dBμV/m) = 20 log Emission level (uV/m).
 3. QP detector shall be applied if not specified.

6.2 Test Instruments

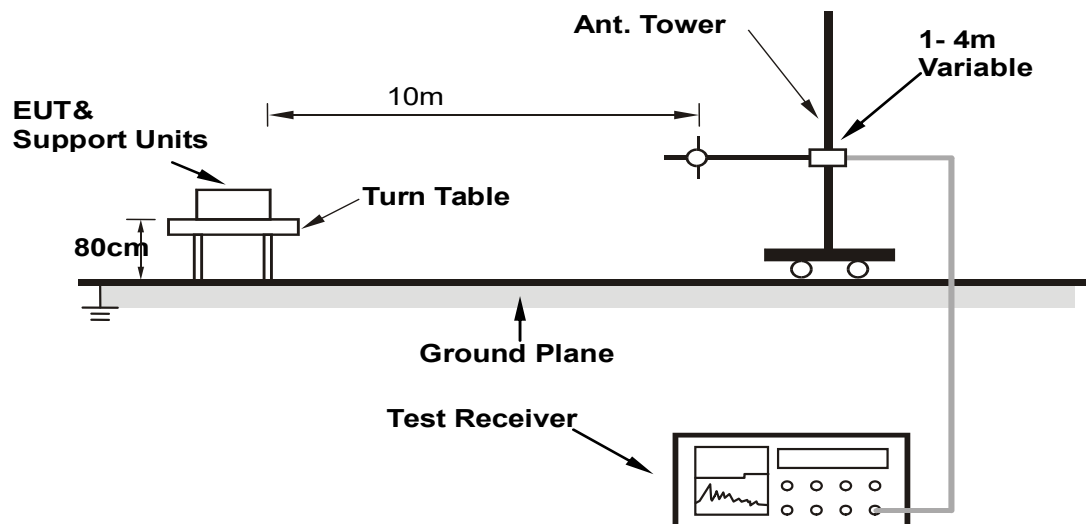
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
EMCI Preamplifier	EMC9135	980326	Feb. 20, 2019	Feb. 19, 2020
EMCI Preamplifier	EMC9135	980327	Feb. 20, 2019	Feb. 19, 2020
Agilent Test Receiver	N9038A	MY50010158	Jun. 27, 2018	Jun. 26, 2019
Agilent Test Receiver	N9038A	MY51210114	Jul. 2, 2018	Jul. 1, 2019
Schwarzbeck Antenna	VULB9168	9168-316	Nov. 27, 2018	Nov. 26, 2019
Schwarzbeck Antenna	VULB9168	9168-317	Nov. 27, 2018	Nov. 26, 2019
Max Full. Turn Table & Tower	MF7802	MF7802121	NA	NA
Max Full. Tower	MF7802	MF780208105	NA	NA
Software	Radiated_V8.7.08	NA	NA	NA
JYEBAO RF cable With 5dB PAD	LMR-600	CABLE-CH8-01.V	Sep. 28, 2018	Sep. 27, 2019
JYEBAO RF cable With 5dB PAD	LMR-600	CABLE-CH8-02.H	Sep. 28, 2018	Sep. 27, 2019
WOKEN RF cable With 5dB PAD	8D	CABLE-CH8-03.3M	Sep. 28, 2018	Sep. 27, 2019

- Note:
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in Chamber No. 8.
 3. The Industry Canada Reference No. IC 7450E-8.
 4. The VCCI Site Registration No. R-12946.
 5. Tested Date: Mar. 21, 2019.

6.3 Test Arrangement

- 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.
- The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

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



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

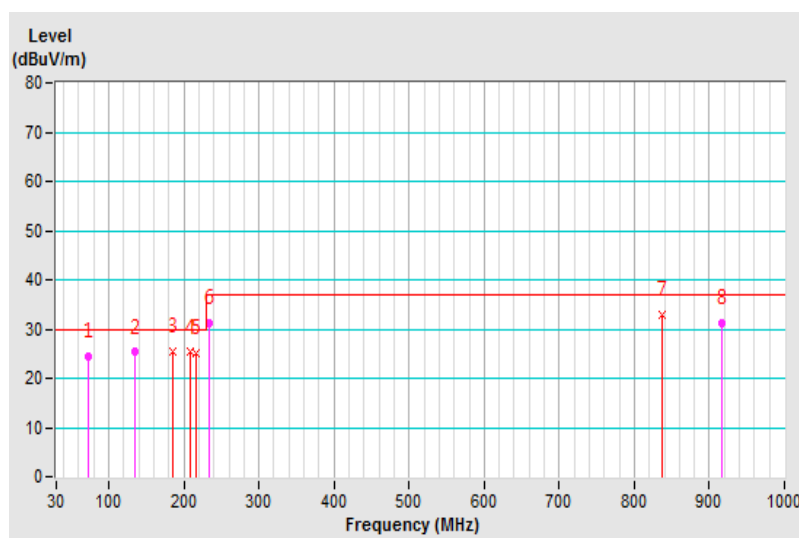
6.4 Test Results

Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	120Vac, 60Hz	Environmental Conditions	19°C, 84%RH
Tested by	Ken Lee		
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	72.00	24.40 QP	30.00	-5.60	3.00 H	251	44.61	-20.21
2	135.20	25.30 QP	30.00	-4.70	4.00 H	18	43.14	-17.84
3	184.30	25.36 QP	30.00	-4.64	4.00 H	36	43.93	-18.57
4	208.89	25.29 QP	30.00	-4.71	3.65 H	266	44.44	-19.15
5	216.00	25.17 QP	30.00	-4.83	3.54 H	87	44.19	-19.02
6	233.48	31.29 QP	37.00	-5.71	4.00 H	169	49.66	-18.37
7	836.89	32.95 QP	37.00	-4.05	3.97 H	316	38.41	-5.46
8	916.94	31.12 QP	37.00	-5.88	1.00 H	173	34.99	-3.87

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

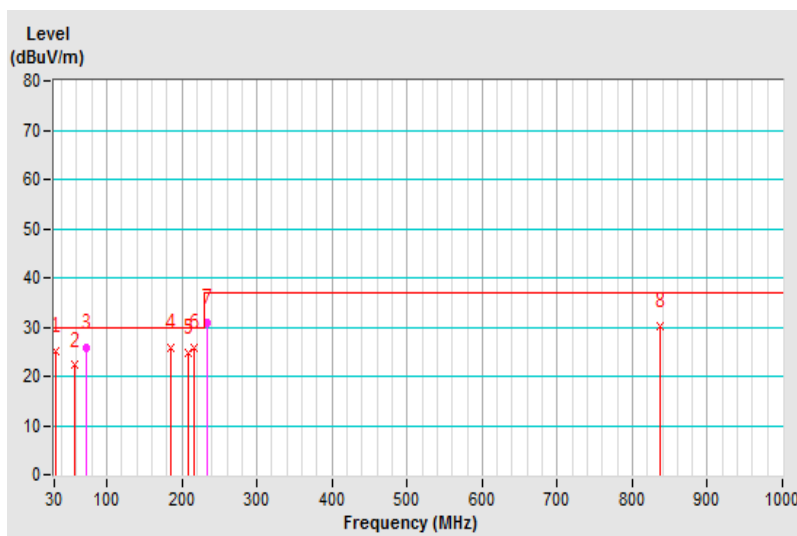


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	120Vac, 60Hz	Environmental Conditions	19°C, 84%RH
Tested by	Ken Lee		
Test Mode	Mode 1		

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	31.63	25.12 QP	30.00	-4.88	1.01 V	146	45.14	-20.02
2	57.73	22.23 QP	30.00	-7.77	1.05 V	44	40.57	-18.34
3	72.00	25.82 QP	30.00	-4.18	2.00 V	106	46.23	-20.41
4	184.31	25.76 QP	30.00	-4.24	1.02 V	289	44.25	-18.49
5	208.89	24.91 QP	30.00	-5.09	1.02 V	342	44.06	-19.15
6	216.00	25.86 QP	30.00	-4.14	1.00 V	268	44.85	-18.99
7	233.46	30.95 QP	37.00	-6.05	1.00 V	301	49.17	-18.22
8	836.38	30.22 QP	37.00	-6.78	2.13 V	4	35.69	-5.47

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

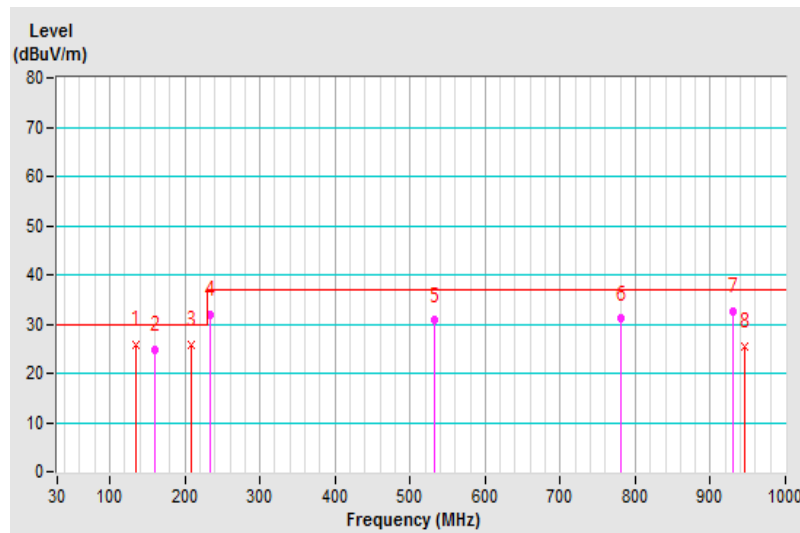


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	120Vac, 60Hz	Environmental Conditions	19°C, 84%RH
Tested by	Ken Lee		
Test Mode	Mode 2		

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	135.16	25.87 QP	30.00	-4.13	4.00 H	6	43.71	-17.84
2	159.74	24.77 QP	30.00	-5.23	3.96 H	46	41.61	-16.84
3	208.89	25.88 QP	30.00	-4.12	3.62 H	312	45.03	-19.15
4	233.48	31.78 QP	37.00	-5.22	3.91 H	198	50.15	-18.37
5	532.99	30.75 QP	37.00	-6.25	1.13 H	245	41.70	-10.95
6	780.00	31.05 QP	37.00	-5.95	1.20 H	215	37.17	-6.12
7	929.48	32.64 QP	37.00	-4.36	1.02 H	166	36.35	-3.71
8	946.06	25.54 QP	37.00	-11.46	1.01 H	196	29.12	-3.58

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

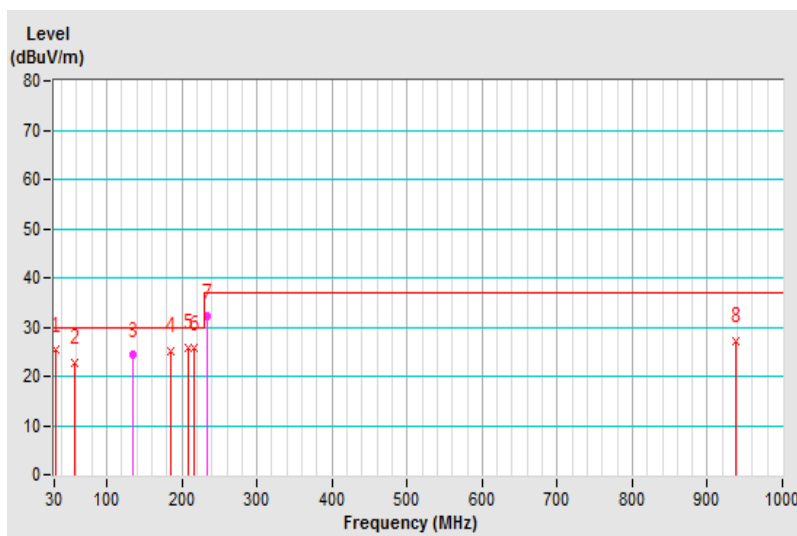


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	120Vac, 60Hz	Environmental Conditions	19°C, 84%RH
Tested by	Ken Lee		
Test Mode	Mode 2		

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	32.37	25.26 QP	30.00	-4.74	1.00 V	73	45.19	-19.93
2	57.70	22.82 QP	30.00	-7.18	1.00 V	85	41.16	-18.34
3	135.15	24.32 QP	30.00	-5.68	1.10 V	281	42.07	-17.75
4	184.32	25.11 QP	30.00	-4.89	1.00 V	281	43.60	-18.49
5	208.89	25.79 QP	30.00	-4.21	1.00 V	299	44.94	-19.15
6	215.99	25.67 QP	30.00	-4.33	1.05 V	331	44.66	-18.99
7	233.48	32.05 QP	37.00	-4.95	1.14 V	252	50.26	-18.21
8	937.81	27.16 QP	37.00	-9.84	1.92 V	19	31.19	-4.03

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 (dB μ V/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	Avg: 43.5	Not defined	Not defined
Above 3000	Peak: 69.5	Peak: 63.5	Not defined	Not defined

Radiated Emissions Limits at 3 meters (dB μ V/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 (dB μ V/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

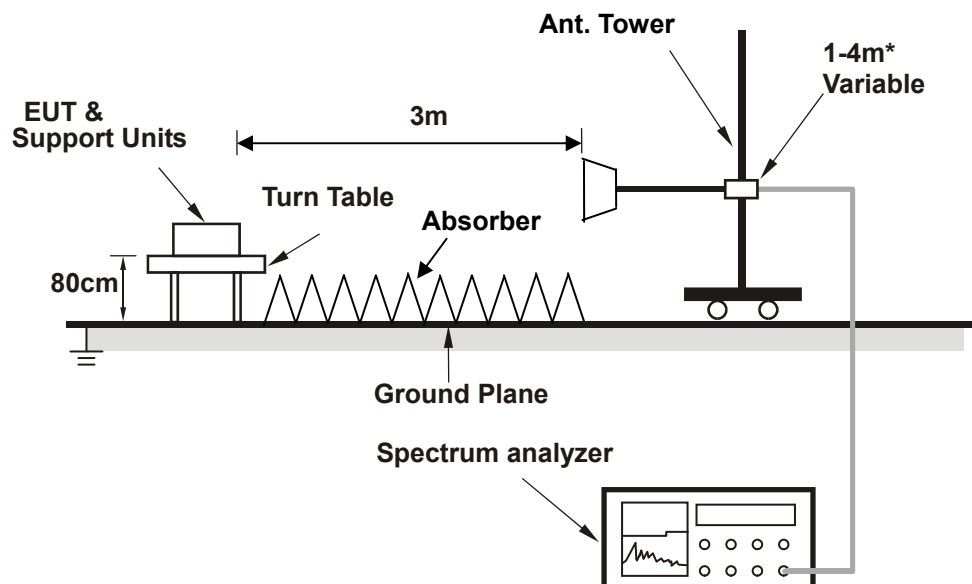
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Agilent Spectrum	E4446A	MY51100009	Jun. 4, 2018	Jun. 3, 2019
Agilent Test Receiver	N9038A	MY51210114	Jul. 2, 2018	Jul. 1, 2019
Agilent Preamplifier	8449B	3008A01924	Feb. 21, 2019	Feb. 20, 2020
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Feb. 21, 2019	Feb. 20, 2020
EMCI Preamplifier	EMC184045B	980235	Feb. 21, 2019	Feb. 20, 2020
ETS Preamplifier	3117-PA	00215857	Nov. 25, 2018	Nov. 24, 2019
Schwarzbeck Horn Antenna	BBHA-9170	212	Nov. 25, 2018	Nov. 24, 2019
ETS Horn Antenna	3117	00123980	Nov. 25, 2018	Nov. 24, 2019
Max Full. Turn Table	MF7802	MF7802121	NA	NA
Max Full. Tower	MF7802	MF780208105	NA	NA
Software	Radiated_V8.7.08	NA	NA	NA
SUHNER +WOKEN RF cable With 3/4dB PAD	SF-102 +WC01	Cable-CH8(3.6m)-02 +Cable-CH8-04	Aug. 13, 2018	Aug. 12, 2019
MICRO-TRONICS Notch filter	BRC50703-01	010	May 31, 2018	May 30, 2019
MICRO-TRONICS Band Pass Filter	BRM17690	005	May 31, 2018	May 30, 2019

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in Chamber No. 8.
 3. The Industry Canada Reference No. IC 7450E-8.
 4. The VCCI Site Registration No. G-10019.
 5. Tested Date: Mar. 20, 2019.

7.3 Test Arrangement

- 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.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- The spectrum analyzer system was set to peak and average detect 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.



* :depends on the EUT height and the antenna 3dB beamwidth both.

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

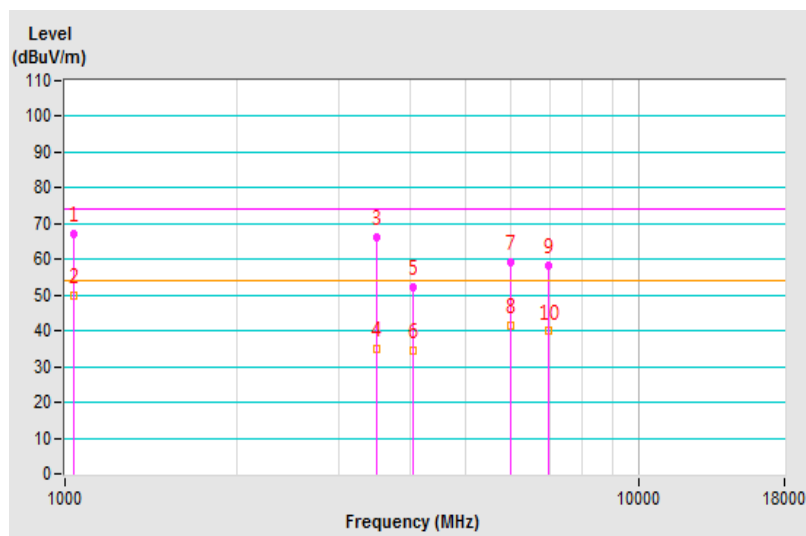
7.4 Test Results

Frequency Range	1GHz ~ 18GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	120Vac, 60Hz	Environmental Conditions	20°C, 83%RH
Tested by	Ken Lee		
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	1036.18	67.27 PK	74.00	-6.73	1.00 H	180	81.17	-13.90
2	1036.18	49.94 AV	54.00	-4.06	1.00 H	180	63.84	-13.90
3	3498.77	66.21 PK	74.00	-7.79	1.10 H	120	73.52	-7.31
4	3498.77	34.88 AV	54.00	-19.12	1.10 H	120	42.19	-7.31
5	4049.01	52.21 PK	74.00	-21.79	1.83 H	360	57.71	-5.50
6	4049.01	34.58 AV	54.00	-19.42	1.83 H	360	40.08	-5.50
7	5994.20	59.18 PK	74.00	-14.82	2.00 H	222	61.71	-2.53
8	5994.20	41.47 AV	54.00	-12.53	2.00 H	222	44.00	-2.53
9	6980.29	58.22 PK	74.00	-15.78	1.73 H	1	59.43	-1.21
10	6980.29	39.87 AV	54.00	-14.13	1.73 H	1	41.08	-1.21

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

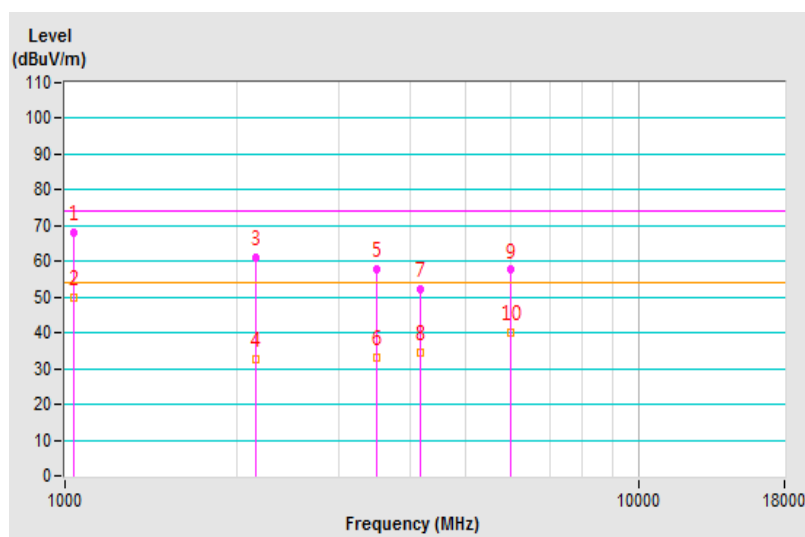


Frequency Range	1GHz ~ 18GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	120Vac, 60Hz	Environmental Conditions	20°C, 83%RH
Tested by	Ken Lee		
Test Mode	Mode 1		

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	1036.16	68.28 PK	74.00	-5.72	1.40 V	152	82.18	-13.90
2	1036.16	49.94 AV	54.00	-4.06	1.40 V	152	63.84	-13.90
3	2149.70	61.29 PK	74.00	-12.71	2.06 V	254	71.74	-10.45
4	2149.70	32.71 AV	54.00	-21.29	2.06 V	254	43.16	-10.45
5	3490.56	57.99 PK	74.00	-16.01	1.01 V	360	65.35	-7.36
6	3490.56	33.24 AV	54.00	-20.76	1.01 V	360	40.60	-7.36
7	4173.74	52.20 PK	74.00	-21.80	1.09 V	360	57.10	-4.90
8	4173.74	34.48 AV	54.00	-19.52	1.09 V	360	39.38	-4.90
9	5994.66	57.68 PK	74.00	-16.32	2.05 V	62	60.20	-2.52
10	5994.66	40.04 AV	54.00	-13.96	2.05 V	62	42.56	-2.52

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

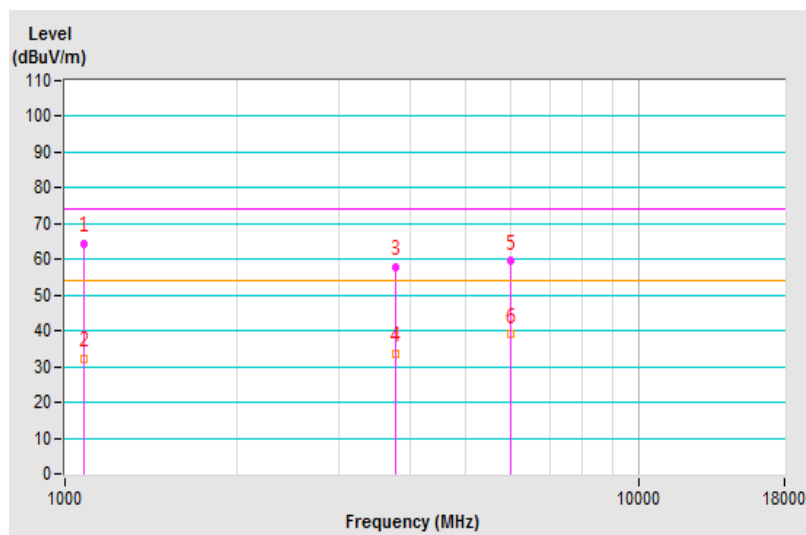


Frequency Range	1GHz ~ 18GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	120Vac, 60Hz	Environmental Conditions	20°C, 83%RH
Tested by	Ken Lee		
Test Mode	Mode 2		

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	1081.94	64.31 PK	74.00	-9.69	1.63 H	23	78.25	-13.94
2	1081.94	32.24 AV	54.00	-21.76	1.63 H	23	46.18	-13.94
3	3773.48	57.75 PK	74.00	-16.25	1.47 H	351	63.99	-6.24
4	3773.48	33.48 AV	54.00	-20.52	1.47 H	351	39.72	-6.24
5	5999.50	59.46 PK	74.00	-14.54	2.15 H	198	61.98	-2.52
6	5999.50	38.92 AV	54.00	-15.08	2.15 H	198	41.44	-2.52

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

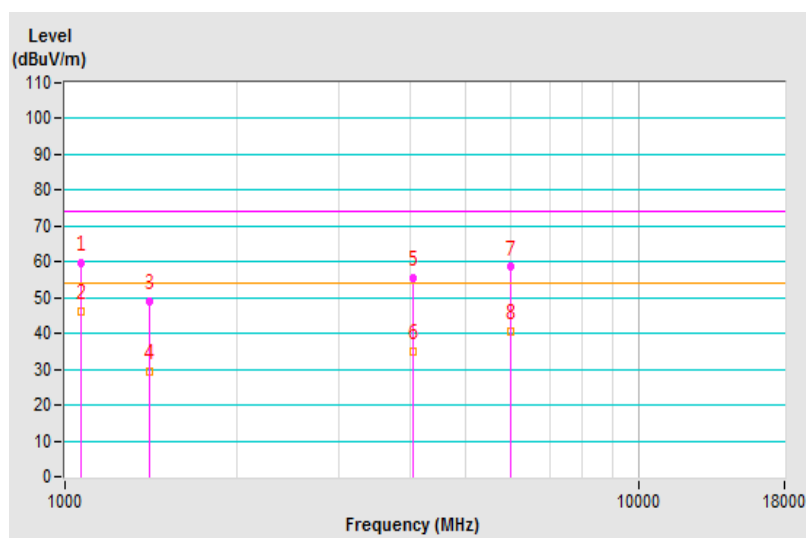


Frequency Range	1GHz ~ 18GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	120Vac, 60Hz	Environmental Conditions	20°C, 83%RH
Tested by	Ken Lee		
Test Mode	Mode 2		

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	1065.78	59.72 PK	74.00	-14.28	2.02 V	168	73.72	-14.00
2	1065.78	46.33 AV	54.00	-7.67	2.02 V	168	60.33	-14.00
3	1400.95	48.94 PK	74.00	-25.06	2.17 V	224	62.91	-13.97
4	1400.95	29.56 AV	54.00	-24.44	2.17 V	224	43.53	-13.97
5	4042.11	55.55 PK	74.00	-18.45	1.00 V	142	61.06	-5.51
6	4042.11	34.93 AV	54.00	-19.07	1.00 V	142	40.44	-5.51
7	5995.50	58.58 PK	74.00	-15.42	1.01 V	168	61.11	-2.53
8	5995.50	40.67 AV	54.00	-13.33	1.01 V	168	43.20	-2.53

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

8.1 Conducted Emissions at Mains Ports

Mode 1



Mode 2



8.2 Radiated Emissions up to 1 GHz

Mode 1

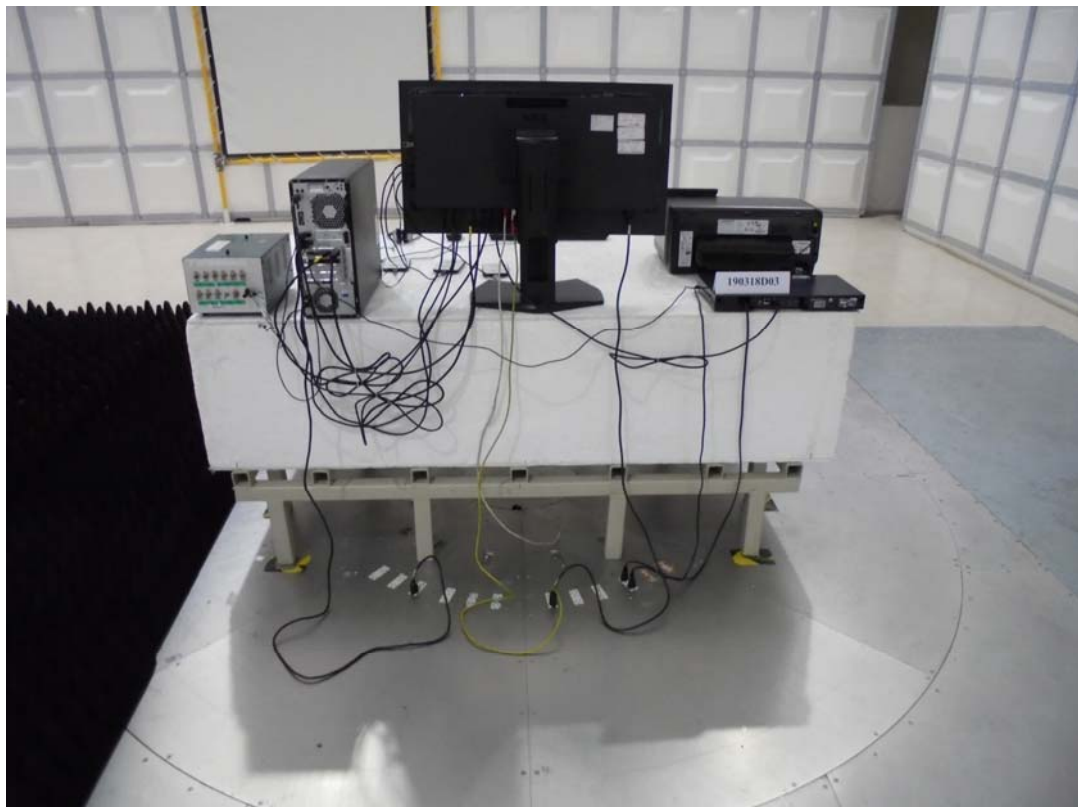


Mode 2

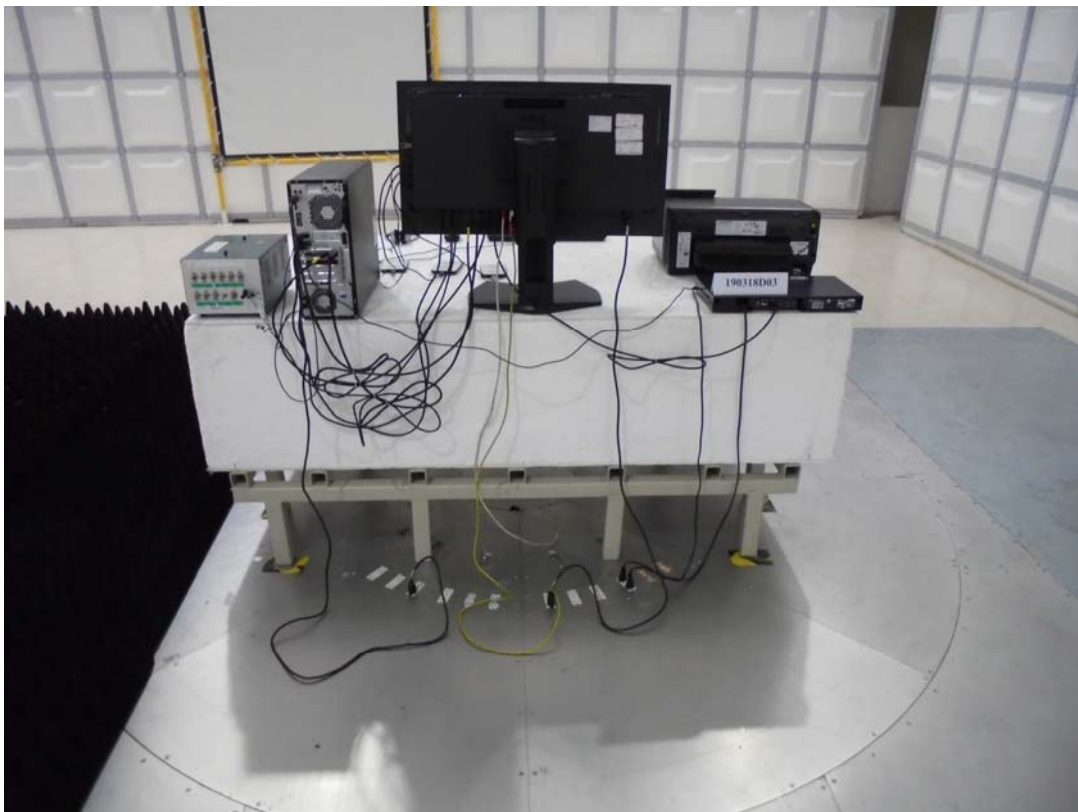
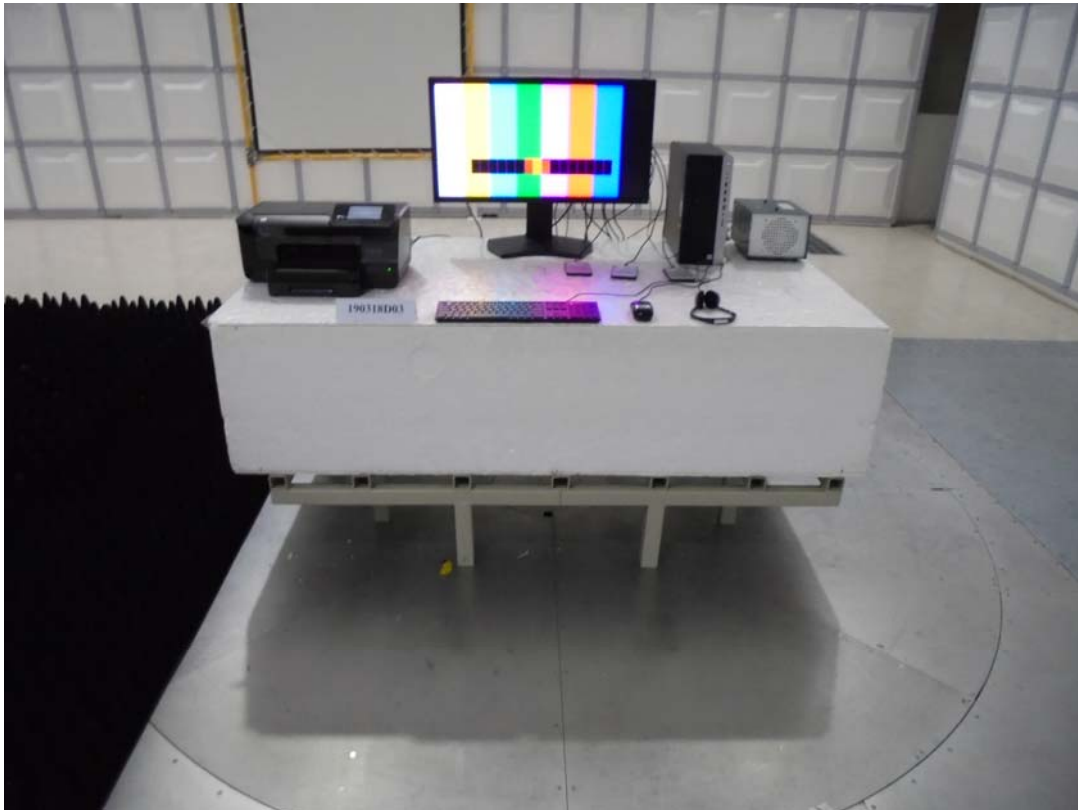


8.3 Radiated Emissions above 1 GHz

Mode 1



Mode 2



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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