

FCC Test Report

Report No.: FD190124C20

Test Model: ECX-1200 / ECX-1400

Series Model: ECX-1XXXXXXXXXXXXXXXXXXXX ("X" can be 0-9, A-Z or blank for marketing purpose)

Received Date: Jan. 24, 2019

Test Date: Mar. 16, 2019 ~ Mar. 18, 2019

Issued Date: Mar. 22, 2019

Applicant: VECOW CO., LTD.

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

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FCC Registration / Designation Number: 328930 / TW1050



Certificate #4327.01



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Release Control Record

Issue No.	Description	Date Issued
FD190124C20	Original Release	Mar. 22, 2019

1 Certificate of Conformity

Product: Expandable Fanless System
Brand: Vecow
Test Model: ECX-1200 / ECX-1400
Series Model: ECX-1XXXXXXXXXXXXXXXXXXXX ("X" can be 0-9, A-Z or blank for marketing purpose)
Sample Status: MASS-PRODUCTION
Applicant: VECOW CO., LTD.
Test Date: Mar. 16, 2019 ~ Mar. 18, 2019
Standards: 47 CFR FCC Part 15, Subpart B, Class A
ICES-003:2016 Issue 6, Class A
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 : Gina Liu , **Date:** Mar. 22, 2019
Gina Liu / Specialist

Approved by : Carl Chen , **Date:** Mar. 22, 2019
Carl Chen / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart B / ICES-003:2016 Issue 6, Class A

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 A margin is -28.41 dB at 17.25400 MHz	Pass
15.109	6.2.1	Radiated Emissions up to 1 GHz	Minimum passing Class A margin is -3.13 dB at 375.00 MHz	Pass
	6.2.2	Radiated Emissions above 1 GHz	Minimum passing Class A margin is -15.50 dB at 2415.06 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	Expanded Uncertainty (k=2) (\pm)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.44 dB
Radiated Emissions up to 1 GHz	30 MHz ~ 1 GHz	4.70 dB
Radiated Emissions above 1 GHz	Above 1 GHz	2.26 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Expandable Fanless System
Brand	Vecow
Test Model	ECX-1200 / ECX-1400
Series Model	ECX-1XXXXXXXXXXXXXXXXXXXXX ("X" can be 0-9, A-Z or blank for marketing purpose)
Status of EUT	MASS-PRODUCTION
Operating Software	Windows 10
Power Supply Rating	24 Vdc (Adapter)
Accessory Device	Refer to Note as below
Data Cable Supplied	Refer to Note as below

Note:

1. All models are listed as below.

Brand	Model	Difference
Vecow	ECX-1200	The ECX-1200 and ECX-1400 are with different appearance and quantity of slot but same for the electrical and layout.
	ECX-1400	

2. The EUT contains following accessory devices.

Product	Brand	Model	Description
Adapter	Meanwell	GST160A24-R7B	I/P: 100-240 Vac, 50/60 Hz, 2.0 A O/P: 24 Vdc, 6.67 A 1.2m non-shielded cable with 1 core
CPU	Intel	I7-8700	3.2GHz
RAM	Kingston	KVR21S15S8/4	4GB

3. There're 2 configurations for the EUT listed as below.

Sample A: ECX-1400

Sample B: ECX-1200

3.2 Features of EUT

The tests reported herein were performed according to the method specified by VECOW 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

Test modes are presented in the report as below.

Mode	Config.	Test Condition
Conducted Emission		
1	A	LAN Link + POE LAN with Camera*4 + USB with M/S + USB with K/B + USB with Flash*3 + RS232 Loop + Mic&Earphone + DP with Monitor*2 + VGA with Monitor + DVI-D Cable + DIO 1&2 Cable + Adapter + CF Card + USB Link Printer
2	A	LAN Link + POE LAN with Camera*4 + USB with M/S + USB with K/B + USB with Flash*3 + RS232 Loop + Mic&Earphone + DP with Monitor*2 + VGA Cable + DVI-D with Monitor + DIO 1&2 Cable + Adapter + CF Card + USB Link Printer
3	B	LAN Link + POE LAN with Camera*4 + USB with M/S + USB with K/B + USB with Flash*3 + RS232 Loop + Mic&Earphone + DP with Monitor*2 + VGA with Monitor + DVI-D Cable + DIO 1&2 Cable + Adapter + CF Card + USB Link Printer
Radiated Emission		
1	A	LAN Link + POE LAN with Camera*4 + USB with M/S + USB with K/B + USB with Flash*3 + RS232 Loop + Mic&Earphone + DP with Monitor*2 + VGA with Monitor + DVI-D Cable + DIO 1&2 Cable + Adapter + CF Card + USB Link Printer
2	A	LAN Link + POE LAN with Camera*4 + USB with M/S + USB with K/B + USB with Flash*3 + RS232 Loop + Mic&Earphone + DP with Monitor*2 + VGA Cable + DVI-D with Monitor + DIO 1&2 Cable + Adapter + CF Card + USB Link Printer
3	B	LAN Link + POE LAN with Camera*4 + USB with M/S + USB with K/B + USB with Flash*3 + RS232 Loop + Mic&Earphone + DP with Monitor*2 + VGA with Monitor + DVI-D Cable + DIO 1&2 Cable + Adapter + CF Card + USB Link Printer

Remark:

1. For conducted emission test, test mode 1 was the worst case and only this mode was presented in the report.
2. For radiated emission test, test mode 1 was the worst case and only this mode was presented in the report.

3.4 Test Program Used and Operation Descriptions

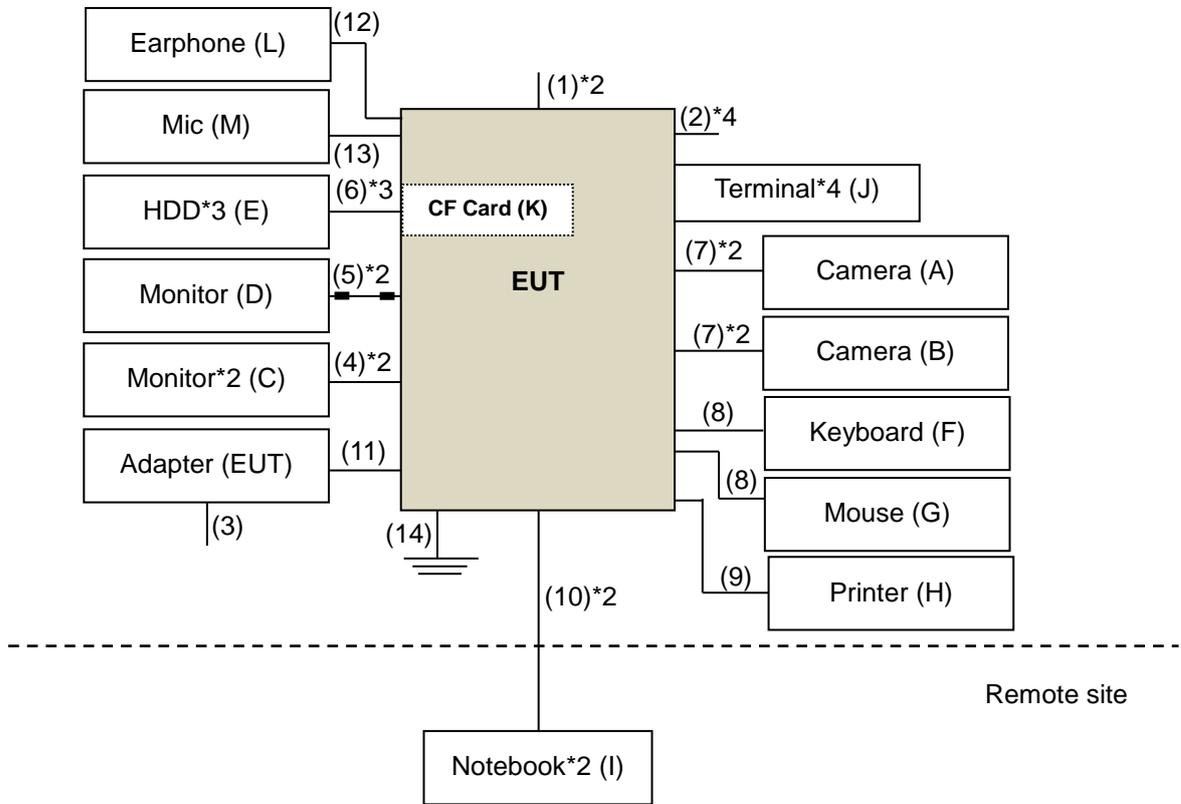
- a. The EUT was charged from adapter.
- b. The EUT linked with Notebooks via cat5e cables.
- c. The EUT linked with Monitors via DP, DVI and VGA cables.
- d. The EUT read and wrote data with HDDs.
- e. The EUT linked with Printer via USB Cable.
- f. The EUT linked with cameras via cat5e cables.
- g. The EUT linked with Terminals, IGN Cables, Ground Cable and DIO Cables.
- h. The EUT communicated data with the Notebooks, which acted as communication partners.

3.5 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 3.2 GHz, provided by VECOW CO., LTD., 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.	Camera	3MP Modorized	A301R2-0309P	N/A	N/A	Provided by client
B.	Camera	1MAG1NSOU RCE	DMK23GV024	N/A	N/A	Provided by client
C.	Monitor*2	DELL	S2817Q	CN-0GD45P-7444 5-6CD-012M-A01	N/A	--
				CN-0GD45P-7444 5-6CD-010M-A01	N/A	--
D.	Monitor	DELL	U2410	CN-0J257M-7287 2-0A6-02YL	Doc	--
E.	HDD*3	TOSHIBA	DTB305	450KWGVQT3ZB	N/A	--
				45U6CMSST3ZB		
				45U6CMT9T3ZB		
F.	USB Keyboard	DELL	KB216t	CN-0W33XP-LO3 00-79R-OUG8-A0 3	N/A	--
G.	USB Mouse	DELL	MOCZUL	CN-049TWY-PRC 00-79E-02FY	N/A	--
H.	USB PRINTER	EPSON	T22	MEEZ070220	N/A	--
I.	Notebook*2	DELL	E6440	6QLNM32	N/A	--
				FMLNM32		
J.	RS232 Terminal	N/A	N/A	N/A	N/A	Provided by client
K.	CF Card	7nnodisk	CFast3ME3	N/A	N/A	--
L.	EARPHONE	PHILIPS	SBC HL150	NA	N/A	--
M.	MICROPHONE	Labtec	LVA7313	N/A	N/A	--

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	IGN Cable	2	0.55	N	0	
2.	DIO Cable	2	0.9	N	0	
		2	0.3	N	0	
3.	Power Cord	1	1.8	N	0	
4.	DP Cable	2	2.0	Y	0	
5.	VGA Cable	1	2..0	Y	2	
	DVI Cable	1	1.8	Y	2	
6.	USB Cable	3	0.5	Y	0	
7.	Cat5e Cable	4	3.0	N	0	
8.	USB Cable	2	1.8	Y	0	
9.	USB Cable	1	1.8	Y	0	
10.	Cat5e Cable	2	10	N	0	
11.	Adaptr Cable	1	1.2	N	1	Accessory of the EUT
12.	Audio Cable	1	1.8	N	0	
13.	Audio Cable	1	1.8	N	0	
14.	Ground Cable	1	2.0	N	0	

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

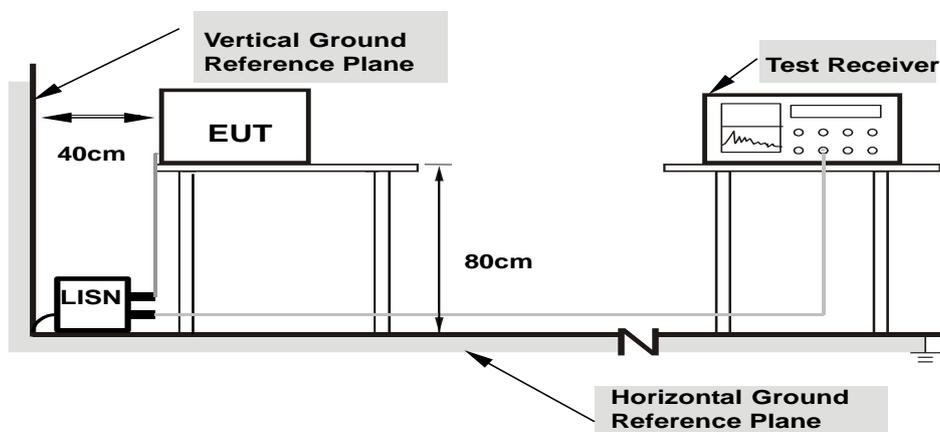
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESR3	102412	Feb. 14, 2019	Feb. 13, 2020
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond2-01	Sep. 05, 2018	Sep. 04, 2019
LISN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Jan. 30, 2019	Jan. 29, 2020
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Aug. 13, 2018	Aug. 12, 2019
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	NA	NA

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 HwaYa Shielded Room 2.
 3. The VCCI Site Registration No. is C-2047.

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/ 50 uH 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 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz – 30 MHz.



- Note: 1. Support units were connected to second LISN.**
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

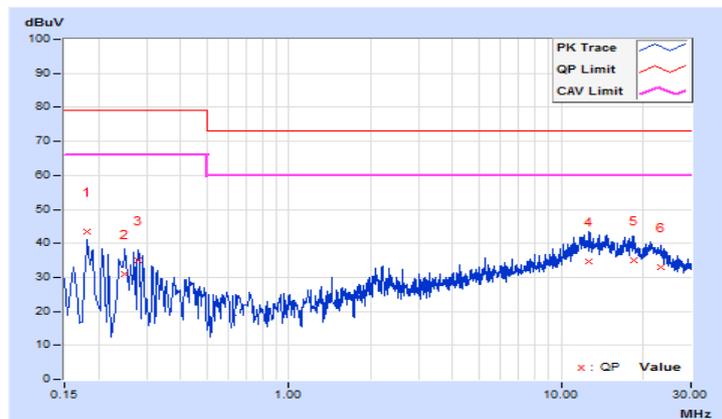
5.4 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 60%RH
Tested by	Daniel Lin	Test Date	2019/3/18
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	0.18200	10.07	33.44	18.78	43.51	28.85	79.00	66.00	-35.49	-37.15
2	0.25000	10.07	20.88	8.19	30.95	18.26	79.00	66.00	-48.05	-47.74
3	0.27859	10.07	24.99	8.05	35.06	18.12	79.00	66.00	-43.94	-47.88
4	12.65400	10.34	24.42	16.57	34.76	26.91	73.00	60.00	-38.24	-33.09
5	18.41000	10.48	24.70	17.80	35.18	28.28	73.00	60.00	-37.82	-31.72
6	23.33000	10.45	22.70	16.51	33.15	26.96	73.00	60.00	-39.85	-33.04

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

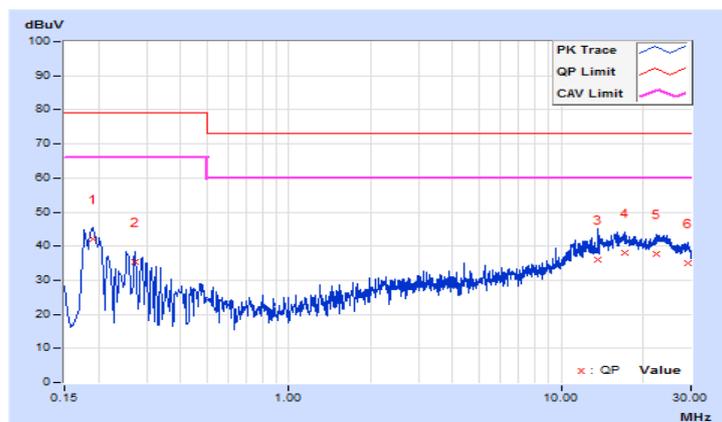


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 60%RH
Tested by	Daniel Lin	Test Date	2019/3/18
Test Mode	Mode 1		

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	0.19013	10.13	31.98	15.79	42.11	25.92	79.00	66.00	-36.89	-40.08
2	0.27350	10.13	25.29	9.51	35.42	19.64	79.00	66.00	-43.58	-46.36
3	13.72600	10.51	25.60	18.63	36.11	29.14	73.00	60.00	-36.89	-30.86
4	17.25400	10.61	27.28	20.98	37.89	31.59	73.00	60.00	-35.11	-28.41
5	22.33800	10.62	27.02	20.07	37.64	30.69	73.00	60.00	-35.36	-29.31
6	29.07000	10.43	24.73	16.28	35.16	26.71	73.00	60.00	-37.84	-33.29

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 (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
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 (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
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 (dB μ V/m) = 20 log Emission level (μ V/m).
3. QP detector shall be applied if not specified.

6.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ (V)	ESR	101240	Oct. 30, 2018	Oct. 29, 2019
Test Receiver ROHDE & SCHWARZ (H)	ESR3	102412	Feb. 14, 2019	Feb. 13, 2020
BILOG Antenna SCHWARZBECK (V)	VULB9168	9168-148	Nov. 20, 2018	Nov. 19, 2019
BILOG Antenna SCHWARZBECK (H)	VULB9168	9168-156	Nov. 20, 2018	Nov. 19, 2019
Preamplifier Sonoma (V)	310N	352924	Jul. 12, 2018	Jul. 11, 2019
Preamplifier Sonoma (H)	310N	352923	Jul. 12, 2018	Jul. 11, 2019
RF signal cable (with 5dB PAD) Times (V)	LMR-600 (18M) +LMR-400 (7M)	CABLE-CH1 (VER) -01	Oct. 03, 2018	Oct. 02, 2019
RF signal cable (with 5dB PAD) Times (H)	LMR-600 (11.8M) +LMR-400 (7M)	CABLE-CH1 (HOR) -01	Oct. 03, 2018	Oct. 02, 2019
Software BV ADT	BV ADT_Radiated_ V8.7.08	NA	NA	NA
Antenna Tower (V)	MFA-440	9707	NA	NA
Antenna Tower (H)	MFA-440	970705	NA	NA
Turn Table	DS430	50303	NA	NA
Controller (V)	MF7802	074	NA	NA
Controller (H)	MF7802	08093	NA	NA

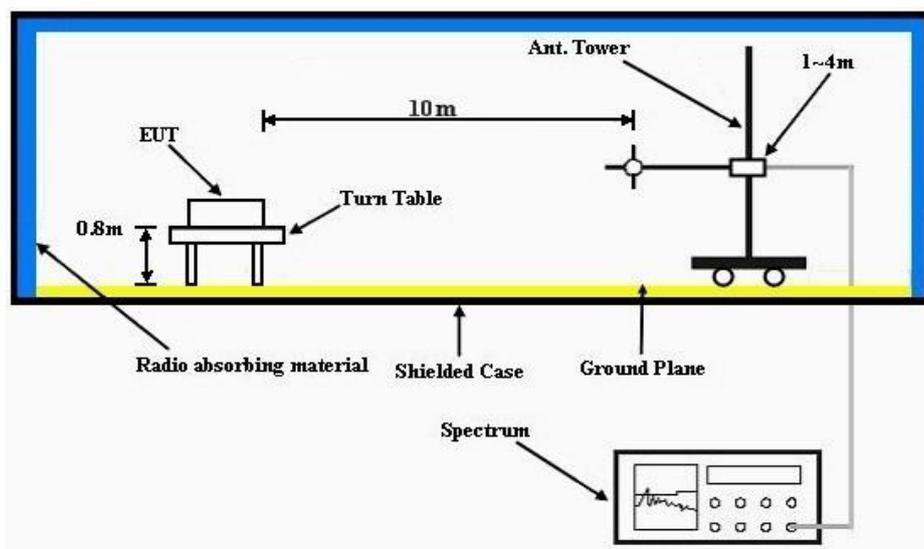
NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Chamber 1.
3. The IC Site Registration No. is IC 7450F-1.
4. The VCCI Site Registration No. is R-1893.

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 120 kHz for quasi-peak detection (QP) at frequency below 1 GHz.



6.4 Test Results

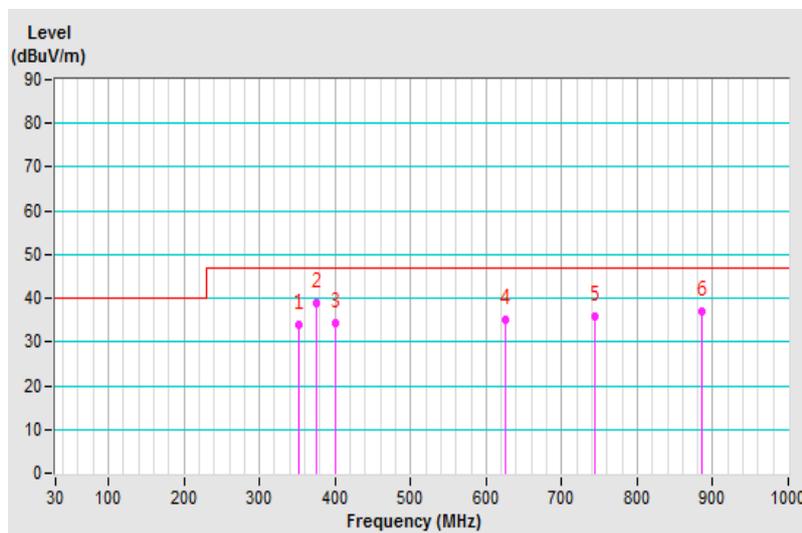
Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Test Mode	Mode 1	Environmental Conditions	22°C, 65%RH
Tested by	Jim Lee	Test Date	2019/3/18

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	351.62	33.96 QP	47.00	-13.04	2.00 H	156	45.22	-11.26
2	375.00	38.97 QP	47.00	-8.03	3.00 H	296	50.26	-11.29
3	399.98	34.21 QP	47.00	-12.79	4.00 H	176	43.44	-9.23
4	625.03	35.20 QP	47.00	-11.80	2.00 H	103	39.69	-4.49
5	744.00	35.94 QP	47.00	-11.06	3.50 H	218	39.38	-3.44
6	885.97	36.99 QP	47.00	-10.01	1.00 H	164	38.33	-1.34

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



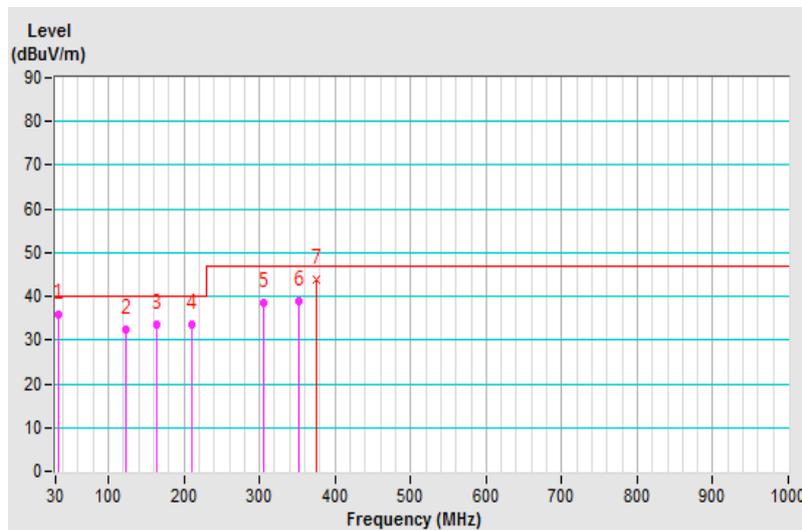
Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Test Mode	Mode 1	Environmental Conditions	22°C, 65%RH
Tested by	Jim Lee	Test Date	2019/3/18

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	34.75	35.70 QP	40.00	-4.30	1.00 V	344	50.85	-15.15
2	122.15	32.24 QP	40.00	-7.76	1.50 V	109	47.99	-15.75
3	164.06	33.39 QP	40.00	-6.61	3.00 V	295	46.37	-12.98
4	210.96	33.67 QP	40.00	-6.33	1.00 V	302	49.25	-15.58
5	304.72	38.46 QP	47.00	-8.54	2.00 V	89	50.46	-12.00
6	351.57	38.90 QP	47.00	-8.10	3.00 V	282	49.75	-10.85
7	375.00	43.87 QP	47.00	-3.13	1.00 V	290	54.69	-10.82

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	Avg: 54	Avg: 56 Peak: 76	Avg: 50 Peak: 70
Above 3000	Peak: 80	Peak: 74	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 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.

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	5 th harmonic of the highest frequency or 40 GHz, whichever is lower

7.2 Test Instruments

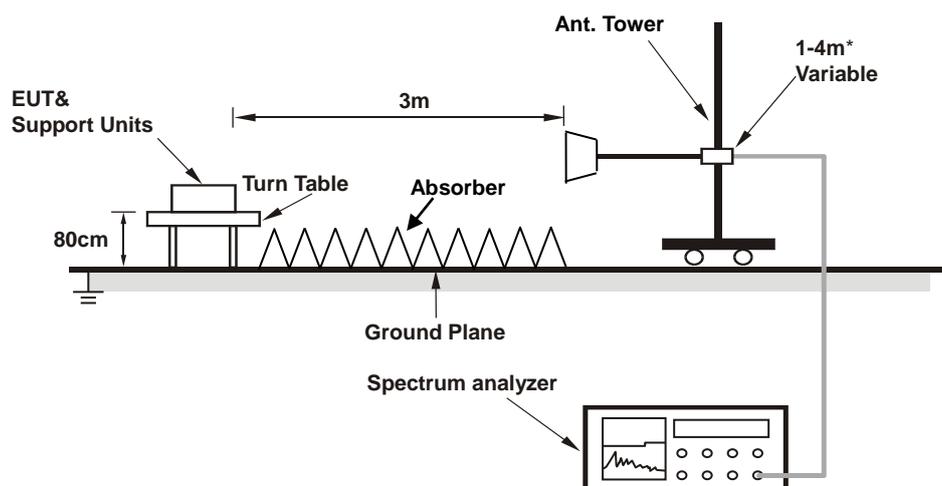
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ (Above 1GHz)	ESR7	101471	Mar. 07, 2019	Mar. 06, 2020
Spectrum Analyzer Agilent	E4446A	MY51100039	Sep. 10, 2018	Sep. 09, 2019
RF signal cable (with 5dB PAD) Times	LMR-400 (18M)	CABLE-CH2-01	Apr. 27, 2018	Apr. 26, 2019
HORN Antenna (with 4dB PAD) SCHWARZBECK	BBHA 9120 D	9120D-405	Nov. 25, 2018	Nov. 24, 2019
Pre-Amplifier Agilent (Above 1GHz)	8449B	3008A01961	Oct. 15, 2018	Oct. 14, 2019
RF Coaxial Cable JUNFLON+EMC	JUNFLON+EMC10 4-SM-SM-6000	Cable-CH2-02(MWX3221308 G003+130710)	Jun. 11, 2018	Jun. 10, 2019
Software BV ADT	BV ADT_Radiated_ V8.7.08	NA	NA	NA
Antenna Tower BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Controller BV ADT	SC100	SC93021702	NA	NA
BandPass Filter (2.4G) MICRO-TRONICS	BRM17690-01	003	Sep. 12, 2018	Sep. 11, 2019
BandPass Filter (5G) MICRO-TRONICS	BRM50716-01	G011	Sep. 12, 2018	Sep. 11, 2019
Fix tool for Boresight antenna	BAF-01	2	NA	NA

- 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 HwaYa Chamber 2.
3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The IC Site Registration No. is IC 7450F-2.
5. The VCCI Site Registration No. is G-10018.

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.
- For frequency range 1 GHz ~ 18 GHz, 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 3 dB 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 1 MHz and video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1 GHz.



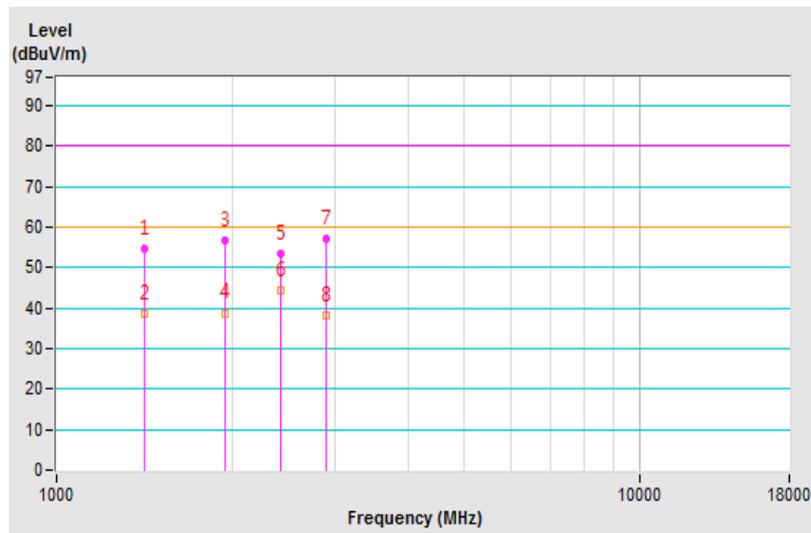
7.4 Test Results

Frequency Range	1GHz ~ 18GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Test Mode	Mode 1	Environmental Conditions	20°C, 60%RH
Tested by	Pon Tsai	Test Date	2019/3/16

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	1413.25	54.47 PK	80.00	-25.53	1.49 H	206	55.82	-1.35
2	1413.25	38.72 AV	60.00	-21.28	1.49 H	206	40.07	-1.35
3	1949.20	56.76 PK	80.00	-23.24	2.50 H	360	56.59	0.17
4	1949.20	38.81 AV	60.00	-21.19	2.50 H	360	38.64	0.17
5	2415.06	53.26 PK	80.00	-26.74	1.49 H	301	50.51	2.75
6	2415.06	44.50 AV	60.00	-15.50	1.49 H	301	41.75	2.75
7	2890.35	57.23 PK	80.00	-22.77	1.49 H	223	53.39	3.84
8	2890.35	38.21 AV	60.00	-21.79	1.49 H	223	34.37	3.84

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



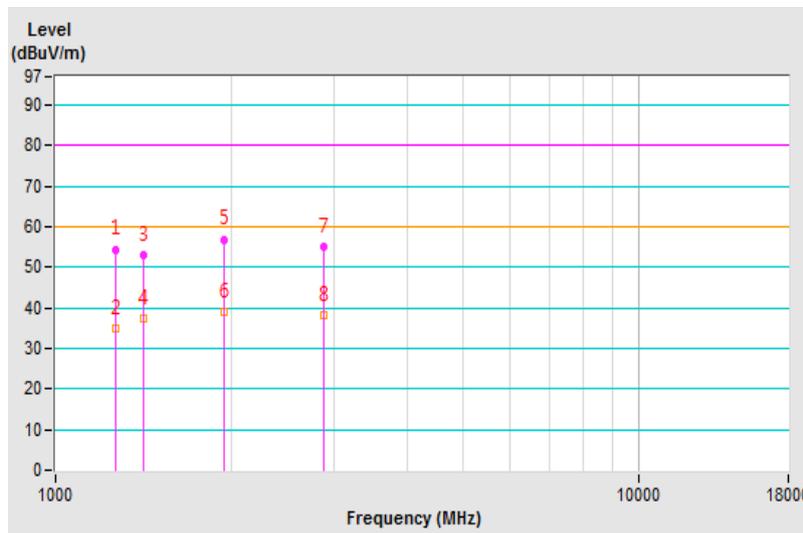
Frequency Range	1GHz ~ 18GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Test Mode	Mode 1	Environmental Conditions	20°C, 60%RH
Tested by	Pon Tsai	Test Date	2019/3/16

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	1269.81	54.43 PK	80.00	-25.57	2.50 V	85	56.65	-2.22
2	1269.81	35.02 AV	60.00	-24.98	2.50 V	85	37.24	-2.22
3	1413.65	52.88 PK	80.00	-27.12	1.49 V	13	54.24	-1.36
4	1413.65	37.34 AV	60.00	-22.66	1.49 V	13	38.70	-1.36
5	1945.56	56.91 PK	80.00	-23.09	1.00 V	56	56.76	0.15
6	1945.56	38.86 AV	60.00	-21.14	1.00 V	56	38.71	0.15
7	2888.47	54.87 PK	80.00	-25.13	1.00 V	164	51.03	3.84
8	2888.47	38.09 AV	60.00	-21.91	1.00 V	164	34.25	3.84

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

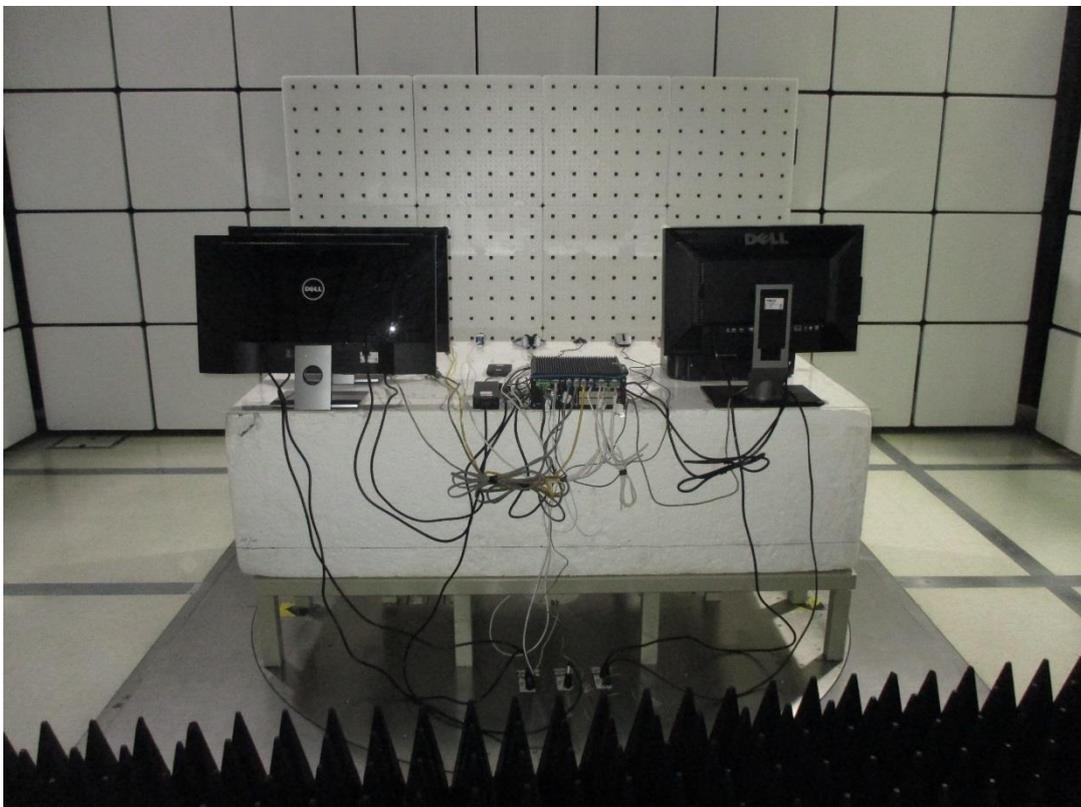
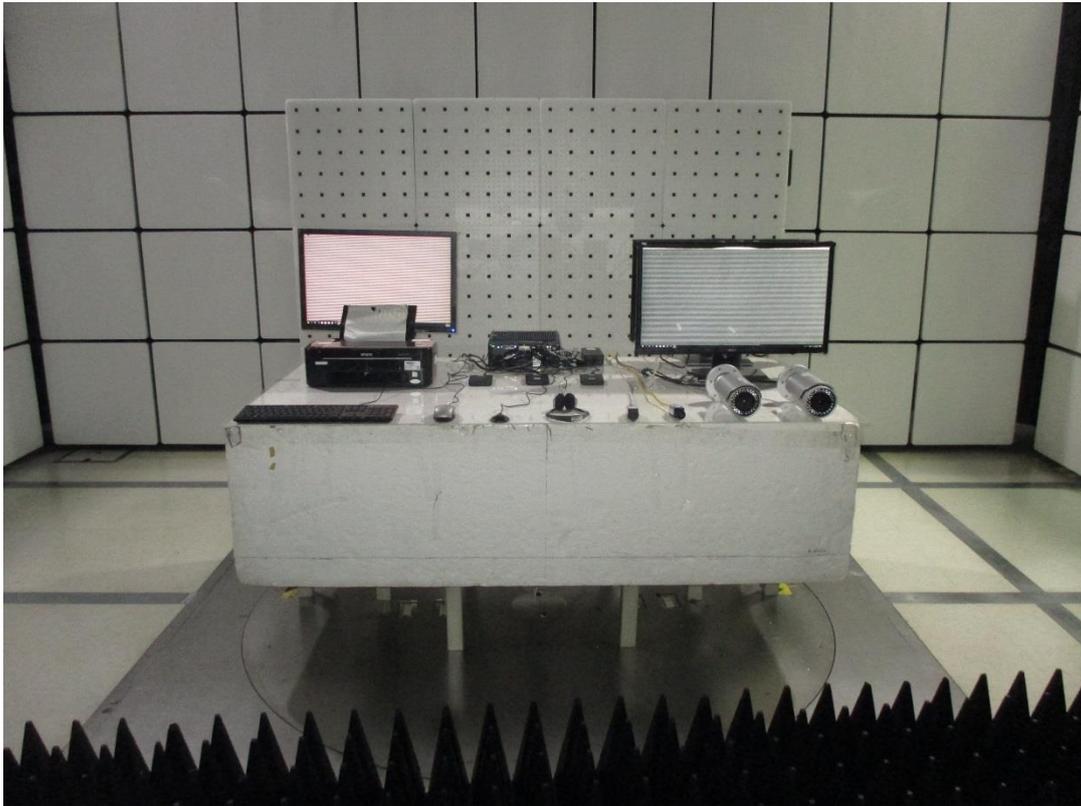
8.1 Conducted Emissions at Mains Ports



8.2 Radiated Emissions up to 1 GHz



8.3 Radiated Emissions above 1 GHz



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:

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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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