

FCC Test Report

Report No.: FD200605D20

Test Model: EMBC-3000-8665U

Series Model: EMBC-3XXXXXXXXXXXXXXXXX ("X" can be 0-9, A-Z or blank for marketing purpose)

Received Date: Dec. 31, 2019

Test Date: Jan. 15 ~ May 26, 2020

Issued Date: Jul. 13, 2020

Applicant: Vecow Co., Ltd.

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

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

Test Location (1): No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City
33383, TAIWAN

Test Location (2): No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

**FCC Registration /
Designation Number:** 328930 / TW1050



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Release Control Record

Issue No.	Description	Date Issued
FD200605D20	Original Release	Jul. 13, 2020

1 Certificate of Conformity

Product: EMBC-3000 Series
Brand: Vecow
Test Model: EMBC-3000-8665U
Series Model: EMBC-3XXXXXXXXXXXXXXXXXXXXX ("X" can be 0-9, A-Z or blank for marketing purpose)
Sample Status: Engineering Sample
Applicant: Vecow Co., Ltd.
Test Date: Jan. 15 ~ May 26, 2020
Standards: 47 CFR FCC Part 15, Subpart B, Class A
ICES-003:2016 Issue 6, updated Apr. 2019, 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 :  , Date: Jul. 13, 2020
Lena Wang / Specialist

Approved by :  , Date: Jul. 13, 2020
Mitch Jen / Assistant Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart B / ICES-003:2016 Issue 6, updated Apr. 2019, 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 -24.27 dB at 0.45859 MHz	Pass
15.109	6.2.1	Radiated Emissions up to 1 GHz	Minimum passing Class A margin is -3.00 dB at 742.50 MHz	Pass
	6.2.2	Radiated Emissions above 1 GHz	Minimum passing Class A margin is -16.47 dB at 1499.95 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	3.00 dB
Radiated Emissions up to 1 GHz	30 MHz ~ 1 GHz	4.14 dB
Radiated Emissions above 1 GHz	Above 1 GHz	5.04 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	EMBC-3000 Series
Brand	Vecow
Test Model	EMBC-3000-8665U
Series Model	EMBC-3XXXXXXXXXXXXXXXXX ("X" can be 0-9, A-Z or blank for marketing purpose)
Model Difference	Refer to Note as below
Status of EUT	Engineering Sample
Operating Software	WIN10
Power Supply Rating	24Vdc (Adapter)
Accessory Device	Refer to Note as below
Data Cable Supplied	1.2m non-shielded DC cable with 1 core

Note:

1. This report issued as a duplicate report to BV CPS report no. FD191231C22. The difference compared with original report is changing model name and product name. The change is no effect on any test items, therefore the original test result is kept
2. All models are listed as below.

Brand	Model	Difference
Vecow	EMBC-3000-8665U	All models are electrically identical, different model names are for marketing purpose.
	EMBC-3XXXXXXXXXXXXXXXXX ("X" can be 0-9, A-Z or blank for marketing purpose)	

3. The EUT is authorized for use in specific End-product. Please refer to below table for more details.

SKU	Brand	Model	Difference
A	Vecow	SPC-5100	Without PoE LAN module
B		SPC-5200	With PoE LAN module

4. The following accessory was for the End-product.

Product	Brand	Model	Description
Adapter	FSP	FSP120-AABN2	I/P: 100-240 Vac, 50-60 Hz, 1.8 A O/P: 24 Vdc, 5 A 1.2 m non-shielded DC cable with 1 core
CPU	Intel	i7-8665UE	Intel® Core™ i7-8665UE Processor 1.7 GHz
Memory	--	--	SLINK DDR4-2666 4GB SODIMM
SATA SDD	Innodisk	3MG2-P	Innodisk 2.5 SATA SSD 3MG2-P 64G
Motherboard	Vecow	EMBC-3XXXXXXXXXXXXXXXXX Series	--
Mini PCIe Digital IO Card	Vecow	DMX-100	--
Mini PCIe 2-port GigE LAN Card	Vecow	LMX-200	--
Mini PCIe 2-port GigE PoE + LAN Card	Vecow	PMX-100	--

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

The EUT is designed with AC power of rating 100-240 Vac, 50/60 Hz.

EUT has been pre-tested under following test modes, and test mode 2 was the worst case for final test.

Mode	SKU	Test Condition
1	A	RS232 with Load + DVI & DP out (1920*1080 & 3840*2160) + LAN 1Gbps Ping + HDD R/W + Mic in + Speaker out
2	B	RS232 with Load + DVI & DP out (1920*1080 & 3840*2160) + LAN 1Gbps Ping + HDD R/W + Mic in + Speaker out + POE out with Camera Ping + DIO with Cable

Test modes are presented in the report as below.

Mode	SKU	Test Condition
Conducted emission test		
-	B	RS232 with Load + DVI & DP out (1920*1080 & 3840*2160) + LAN 1Gbps Ping + HDD R/W + Mic in + Speaker out + POE out with Camera Ping + DIO with Cable
Radiated emission test		
-	B	RS232 with Load + DVI & DP out (1920*1080 & 3840*2160) + LAN 1Gbps Ping + HDD R/W + Mic in + Speaker out + POE out with Camera Ping + DIO with Cable

3.4 Test Program Used and Operation Descriptions

- a. The EUT powered by adapter and placed on the test table.
- b. The EUT linked with Notebook via LAN cable.
- c. The camera powered by SPC-5200 through LAN.
- d. The EUT sent audio signal to the earphone / Microphone.
- e. The EUT read and wrote data with HDD via USB Cable.
- f. The EUT sent "H" patterns to monitors, and monitors displayed them via DVI cable / DP Cable.
- g. The EUT linked with Mouse and Keyboard via USB cable.
- h. The EUT linked with RS-232 TERMINAL.
- i. The EUT communicated data with the Notebooks, which acted as communication partners.

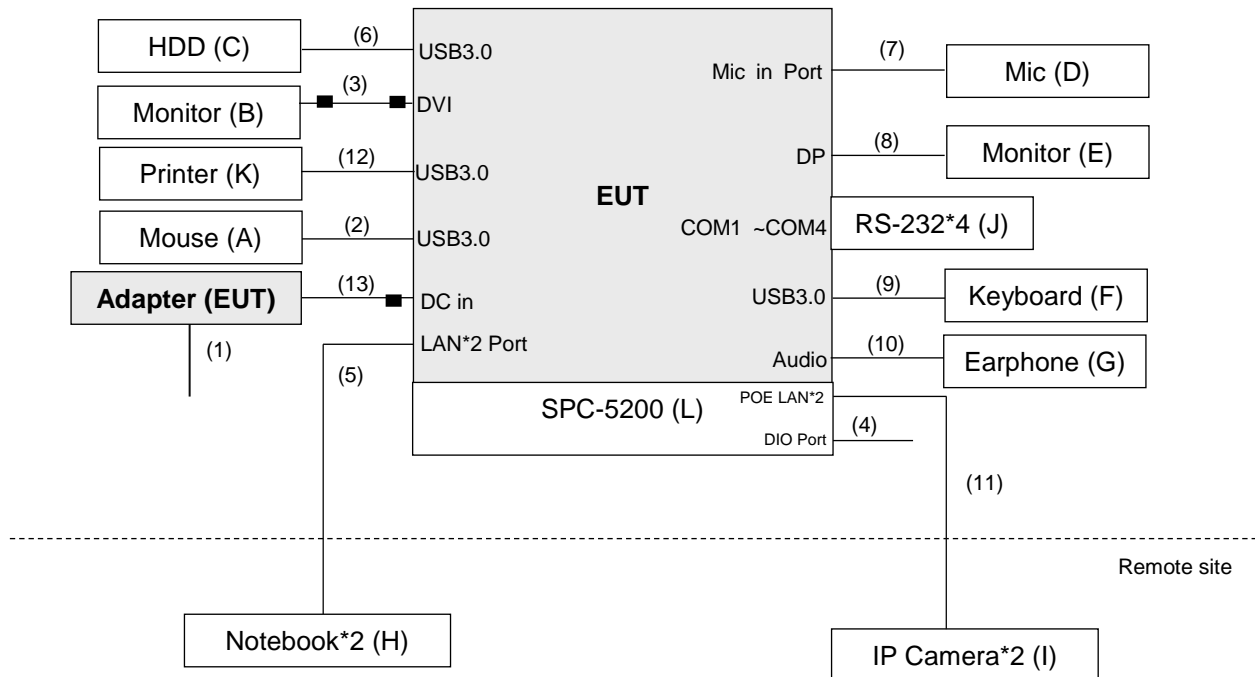
3.5 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 1.7 GHz, provided by Vecow Co., Ltd., for detailed internal source, please refer to the manufacturer's specifications.

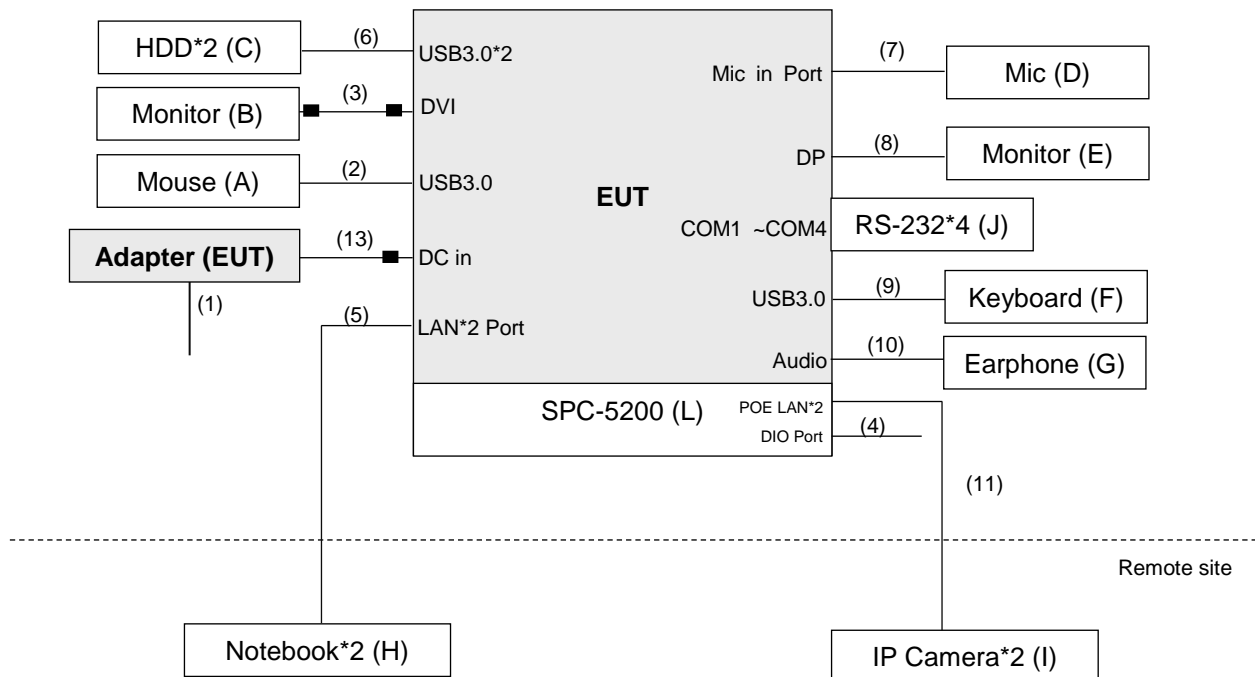
4 Configuration and Connections with EUT

4.1 Connection Diagram of EUT and Peripheral Devices

For Conducted Emission



For Radiated Emission



4.2 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Mouse	DELL	MOCZUL	CN-049TWY-PRC00-77B-007Q	N/A	For Conducted
		DELL	MOCZUL	CN-049TWY-PRC00-79E-02F8	N/A	For Radiated Emission
B.	Monitor	DELL	U2410	CN082WXD728720CC0 KVL	Doc	For Conducted
		DELL	U2410	CN-0J257M-72872-0A6-02YL	Doc	For Radiated Emission
C.	3.0 HDD	WD	WDBK VX5120PSL	1922JG401229	FCC Doc	For Conducted
		TOSHIBA	DTB305	45TGCN0IT3ZB	N/A	For Radiated Emission
		TOSHIBA	DTB305	45U6CMSPT3ZB	N/A	
D.	MICROPHONE	Labtec	mic-333	N/A	N/A	For Conducted
		Labtec	LVA7313	N/A	N/A	For Radiated Emission
E.	Monitor	ASUS	MX27U	K1LMRS022996	N/A	For Conducted
		ASUS	MX27U	N/A	N/A	For Radiated Emission
F.	Keyboard	Dell	KB216t	CN-0W33XP-LO300-7CL-1909	N/A	For Conducted
		DELL	KB4021	CN-05V23T-71581-1AK-01Q2-A01	FCC DoC Approved	For Radiated Emission
G.	Earphone	PHILIPS	SBC HL150	H2010147	N/A	For Conducted
		PHILIPS	SBC HL150	NA	N/A	For Radiated Emission
H.	Notebook	Dell	E7440	3TLJL12	N/A	For Conducted
		Dell	E5420	FHNW4S1	N/A	
		DELL	E6440	FMLNM32	N/A	For Radiated Emission
		DELL	E6440	FNLNM32	N/A	
I.	IP Camera*2	N/A	N/A	N/A	N/A	Provided by client
J.	RS-232 TERMINAL*4	N/A	N/A	N/A	N/A	Provided by client
K.	Printer	EPSON	LQ-300+II	G88Y125418	FCC DoC Approved	--
L.	SPC-5000 Series	Vecow	SPC-5200	N/A	N/A	Provided by client

Note:

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

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	AC Power Cable	1	1.8	N	0	--
2.	Mouse Cable	1	1.8	Y	0	For Conducted
		1	1.8	Y	0	For Radiated Emission
3.	DVI Cable	1	1.8	Y	2	--
4.	DIO Cable	1	0.2	N	0	Provided by client
5.	LAN Cable	2	10	Y	0	For Conducted, Cat5e
		2	10	N	0	For Radiated Emission, Cat5e
6.	3.0 HDD Cable	1	0.5	Y	0	For Conducted
		2	0.5	Y	0	For Radiated Emission
7.	Mic Cable	1	1.5	Y	0	For Conducted
		1	1.5	Y	0	For Radiated Emission
8.	DP Cable	1	1.8	Y	0	--
9.	Keyboard Cable	1	1.8	Y	0	For Conducted
		1	1.8	Y	0	For Radiated Emission
10.	Earphone Cable	1	1.2	Y	0	For Conducted
		1	1.2	Y	0	For Radiated Emission
11.	LAN Cable	2	10	Y	0	For Conducted
		2	10	N	0	For Radiated Emission
12.	USB Cable	1	1.8	Y	0	For Conducted
13.	DC Cable	1	1.2	N	1	Provided by client

Note:

1. The core(s) is(are) originally attached to the cable(s).
2. The test condition of setup was according to manufacturer's requirement.

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

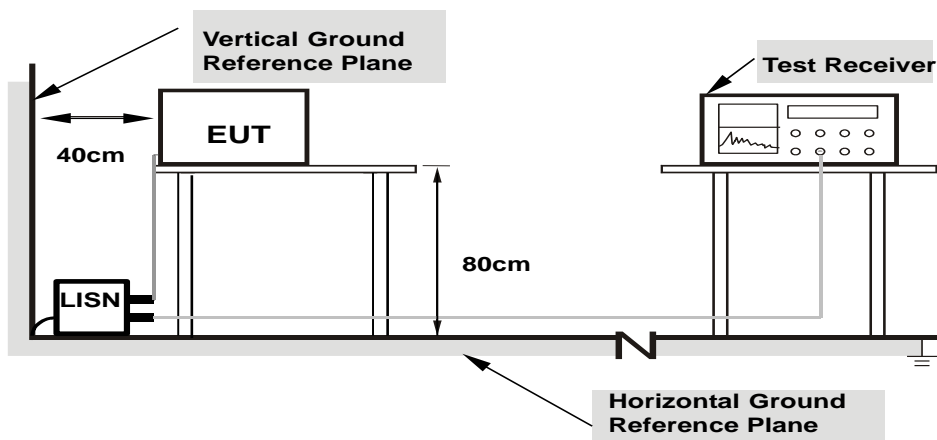
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ TEST RECEIVER	ESCS 30	838251/021	Oct. 30, 2019	Oct. 29, 2020
ROHDE & SCHWARZ Artificial Mains Network (For EUT)	ENV216	101195	May 15, 2020	May 14, 2021
LISN With Adapter (for EUT)	101195	N/A	May 15, 2020	May 14, 2021
EMCO L.I.S.N. (For peripherals)	3825/2	9504-2359	Jul. 31, 2019	Jul. 30, 2020
SCHWARZBECK Artificial Mains Network (For EUT)	NNLK8129	8129229	May 14, 2020	May 13, 2021
SCHWARZBECK Artificial Mains Network (for EUT)	NNLK 8121	8121-808	Apr. 10, 2020	Apr. 09, 2021
Software	Cond_V7.3.7.4	NA	NA	NA
RF cable (JYEBAO) With 10dB PAD	5D-FB	Cable-C03-01	Sep. 17, 2019	Sep. 16, 2020
LYNICS Terminator (For EMCO LISN)	0900510	E1-01-300	Jan. 20, 2020	Jan. 19, 2021
LYNICS Terminator (For EMCO LISN)	0900510	E1-01-301	Jan. 20, 2020	Jan. 19, 2021
ROHDE & SCHWARZ Artificial Mains Network (For TV EUT)	ENV216	101196	Apr. 20, 2020	Apr. 19, 2021
LISN With Adapter (for TV EUT)	101196	NA	Apr. 20, 2020	Apr. 19, 2021

- 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 Lin Kou Shielded Room No. 3.
 3. The VCCI Site Registration No. C-10274.

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

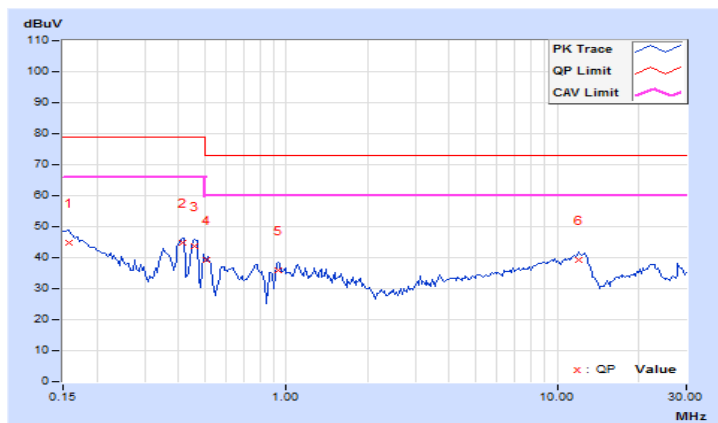
5.4 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 69%RH
Tested by	John Liao	Test Date	2020/5/21
Test Mode	SKU B (EUT Sample no. 013-002)		

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	0.15781	9.68	35.23	19.65	44.91	29.33	79.00	66.00	-34.09	-36.67
2	0.41563	9.68	35.23	30.12	44.91	39.80	79.00	66.00	-34.09	-26.20
3	0.45860	9.68	34.02	30.35	43.70	40.03	79.00	66.00	-35.30	-25.97
4	0.50763	9.68	29.63	20.82	39.31	30.50	73.00	60.00	-33.69	-29.50
5	0.93388	9.70	26.11	18.20	35.81	27.90	73.00	60.00	-37.19	-32.10
6	11.96876	9.89	29.32	22.28	39.21	32.17	73.00	60.00	-33.79	-27.83

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

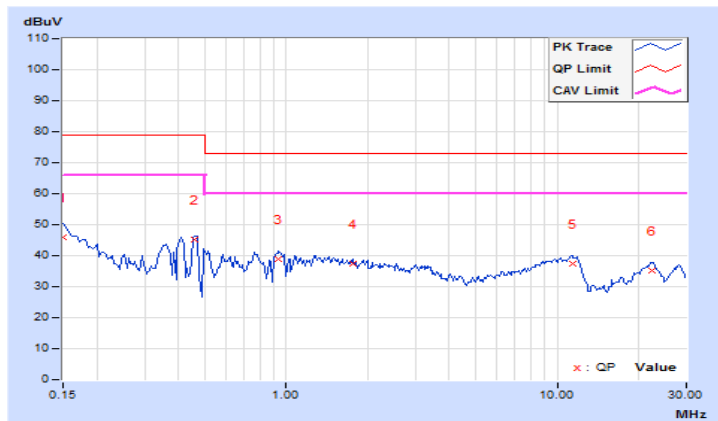


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 69%RH
Tested by	John Liao	Test Date	2020/5/21
Test Mode	SKU B (EUT Sample no. 013-002)		

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	0.15006	9.67	36.32	23.15	45.99	32.82	79.00	66.00	-33.01	-33.18
2	0.45859	9.67	35.45	32.06	45.12	41.73	79.00	66.00	-33.88	-24.27
3	0.93906	9.70	29.32	22.58	39.02	32.28	73.00	60.00	-33.98	-27.72
4	1.75781	9.75	27.52	19.30	37.27	29.05	73.00	60.00	-35.73	-30.95
5	11.39063	9.89	27.45	20.32	37.34	30.21	73.00	60.00	-35.66	-29.79
6	22.51955	10.01	25.12	16.88	35.13	26.89	73.00	60.00	-37.87	-33.11

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. 31, 2019	Oct. 30, 2020
Test Receiver ROHDE & SCHWARZ (H)	ESR	101264	Apr. 16, 2020	Apr. 15, 2021
BILOG Antenna SCHWARZBECK (V)	VULB9168	9168-148	Nov. 08, 2019	Nov. 07, 2020
BILOG Antenna SCHWARZBECK (H)	VULB9168	9168-156	Nov. 08, 2019	Nov. 07, 2020
Preamplifier Sonoma (V)	310N	352924	Jun. 11, 2019	Jun. 10, 2020
Preamplifier Sonoma (H)	310N	352923	Jun. 11, 2019	Jun. 10, 2020
RF signal cable (with 5dB PAD) Times (V)	LMR-600 (18M) +LMR-400 (7M)	CABLE-CH1 (VER) -01	Sep. 05, 2019	Sep. 04, 2020
RF signal cable (with 5dB PAD) Times (H)	LMR-600 (11.8M) +LMR-400 (7M)	CABLE-CH1 (HOR) -01	Sep. 05, 2019	Sep. 04, 2020
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.

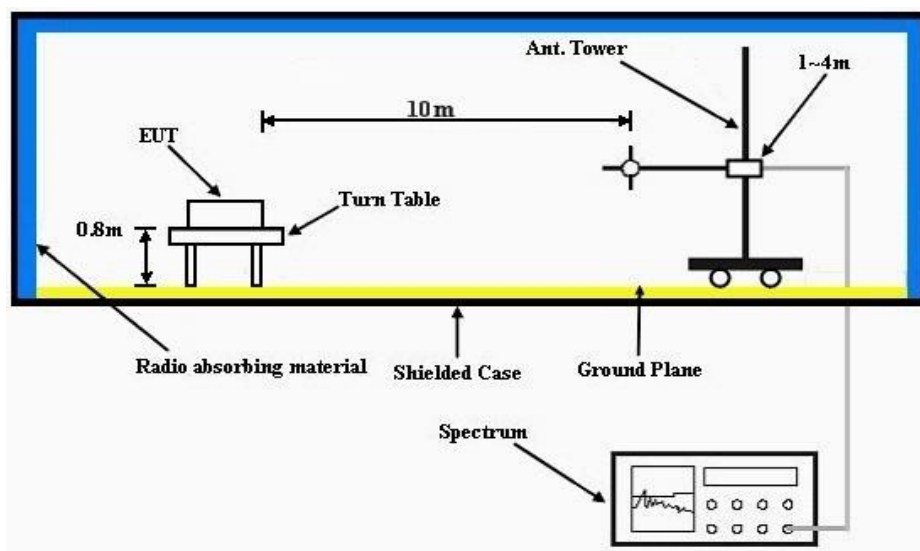
2. The test was performed in HwaYa Chamber 1.

3. The VCCI Site Registration No. is R-11893.

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.



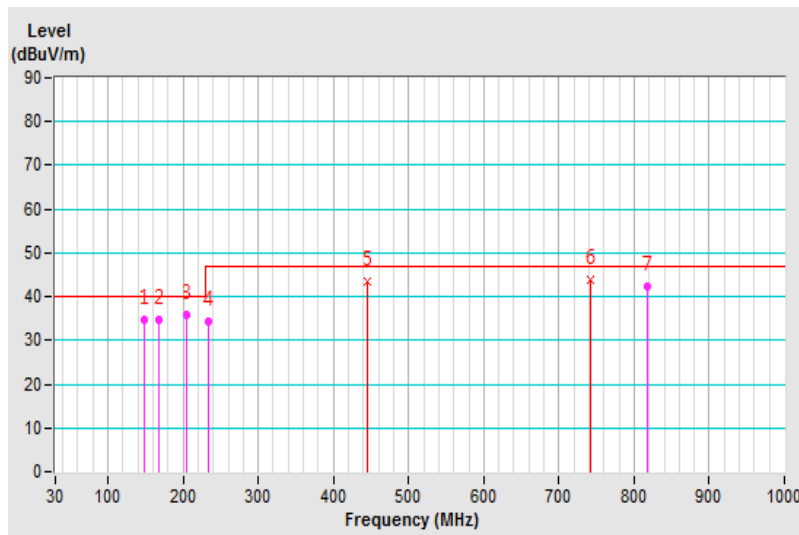
6.4 Test Results

Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Test Mode	SKU B (EUT Sample no. 013-002)	Environmental Conditions	22°C, 62%RH
Tested by	Daniel Lin	Test Date	2020/5/26

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	148.49	34.52 QP	40.00	-5.48	3.50 H	111	47.69	-13.17
2	167.99	34.79 QP	40.00	-5.21	3.50 H	121	48.12	-13.33
3	204.12	35.81 QP	40.00	-4.19	3.50 H	76	51.75	-15.94
4	233.32	34.42 QP	47.00	-12.58	3.00 H	60	49.41	-14.99
5	445.47	43.30 QP	47.00	-3.70	2.50 H	72	50.88	-7.58
6	742.50	44.00 QP	47.00	-3.00	4.00 H	247	47.34	-3.34
7	816.76	42.23 QP	47.00	-4.77	1.00 H	178	44.89	-2.66

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

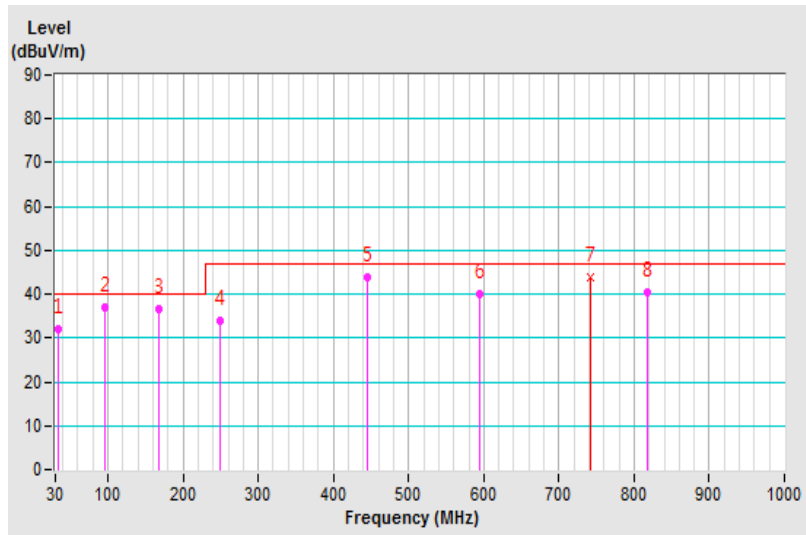


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Test Mode	SKU B (EUT Sample no. 013-002)	Environmental Conditions	22°C, 62%RH
Tested by	Daniel Lin	Test Date	2020/5/26

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	34.07	32.08 QP	40.00	-7.92	2.50 V	274	46.59	-14.51
2	96.88	36.90 QP	40.00	-3.10	1.50 V	139	55.14	-18.24
3	167.99	36.42 QP	40.00	-3.58	1.00 V	330	49.71	-13.29
4	249.96	33.78 QP	47.00	-13.22	2.50 V	343	48.00	-14.22
5	445.47	43.70 QP	47.00	-3.30	1.00 V	100	52.26	-8.56
6	593.99	40.14 QP	47.00	-6.86	3.50 V	159	45.66	-5.52
7	742.50	43.83 QP	47.00	-3.17	2.50 V	144	47.31	-3.48
8	816.76	40.56 QP	47.00	-6.44	2.00 V	189	42.51	-1.95

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

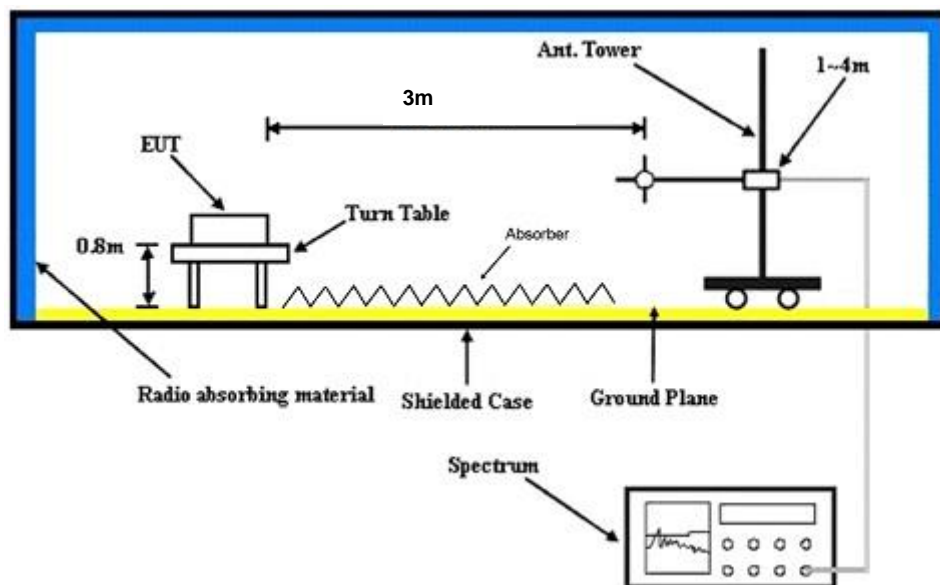
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ (Above 1GHz)	ESR7	101471	Mar. 07, 2019	Mar. 06, 2020
Spectrum Analyzer Agilent	E4446A	MY51100039	Sep. 05, 2019	Sep. 04, 2020
RF signal cable (with 5dB PAD) Times	LMR-400 (18M)	CABLE-CH2-01	Mar. 25, 2019	Mar. 24, 2020
HORN Antenna (with 4dB PAD) SCHWARZBECK	BBHA 9120 D	9120D-405	Nov. 24, 2019	Nov. 23, 2020
Pre-Amplifier Agilent (Above 1GHz)	8449B	3008A01961	Sep. 05, 2019	Sep. 04, 2020
RF Coaxial Cable JUNFLON+EMC	JUNFLON+EMC10 4-SM-SM-6000	Cable-CH2- 02(MWX3221308G003+1307 10)	Jun. 11, 2019	Jun. 10, 2020
Software BV ADT	BV ADT_Radiated_ V8.7.08	NA	NA	NA
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
RF Coaxial Cable EMCI	EMC102-KM-KM- 1000	170819	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable Rosnol	K1K50-UP0279- K1K50-3000	181129-1	Oct. 08, 2019	Oct. 07, 2020
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 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.



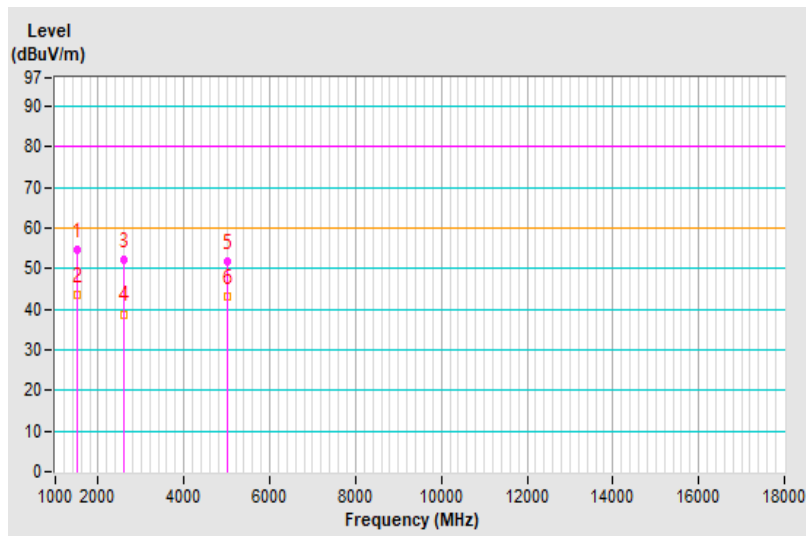
7.4 Test Results

Frequency Range	1GHz ~ 9GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Test Mode	SKU B (EUT Sample no. 013-002)	Environmental Conditions	25°C, 64%RH
Tested by	Pon Tsai	Test Date	2020/1/15

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	1499.95	54.66 PK	80.00	-25.34	1.00 H	162	57.42	-2.76
2	1499.95	43.53 AV	60.00	-16.47	1.00 H	162	46.29	-2.76
3	2587.72	52.30 PK	80.00	-27.70	1.00 H	150	51.88	0.42
4	2587.72	38.84 AV	60.00	-21.16	1.00 H	150	38.42	0.42
5	5000.05	51.65 PK	80.00	-28.35	1.74 H	154	45.86	5.79
6	5000.05	43.08 AV	60.00	-16.92	1.74 H	154	37.29	5.79

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

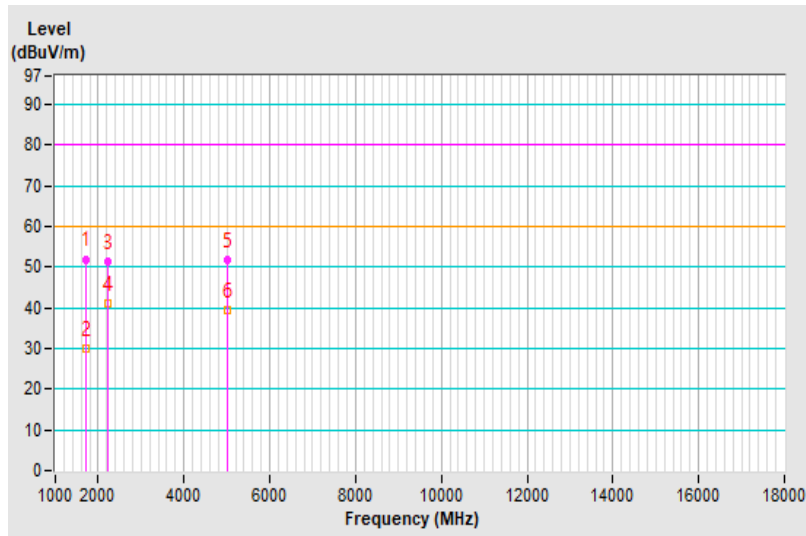


Frequency Range	1GHz ~ 9GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Test Mode	SKU B (EUT Sample no. 013-002)	Environmental Conditions	25°C, 64%RH
Tested by	Pon Tsai	Test Date	2020/1/15

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	1724.33	51.98 PK	80.00	-28.02	1.00 V	219	54.61	-2.63
2	1724.33	29.95 AV	60.00	-30.05	1.00 V	219	32.58	-2.63
3	2227.43	51.22 PK	80.00	-28.78	1.24 V	50	50.33	0.89
4	2227.43	41.17 AV	60.00	-18.83	1.24 V	50	40.28	0.89
5	4999.87	51.88 PK	80.00	-28.12	1.50 V	172	46.09	5.79
6	4999.87	39.36 AV	60.00	-20.64	1.50 V	172	33.57	5.79

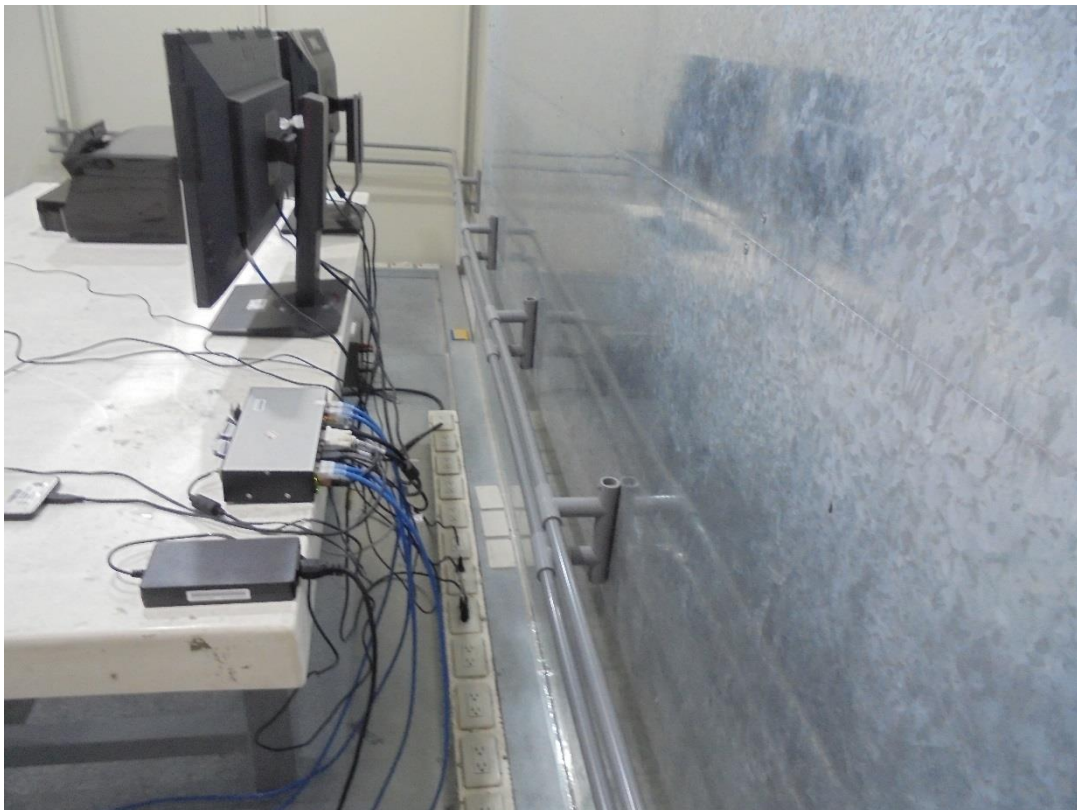
Remarks:

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

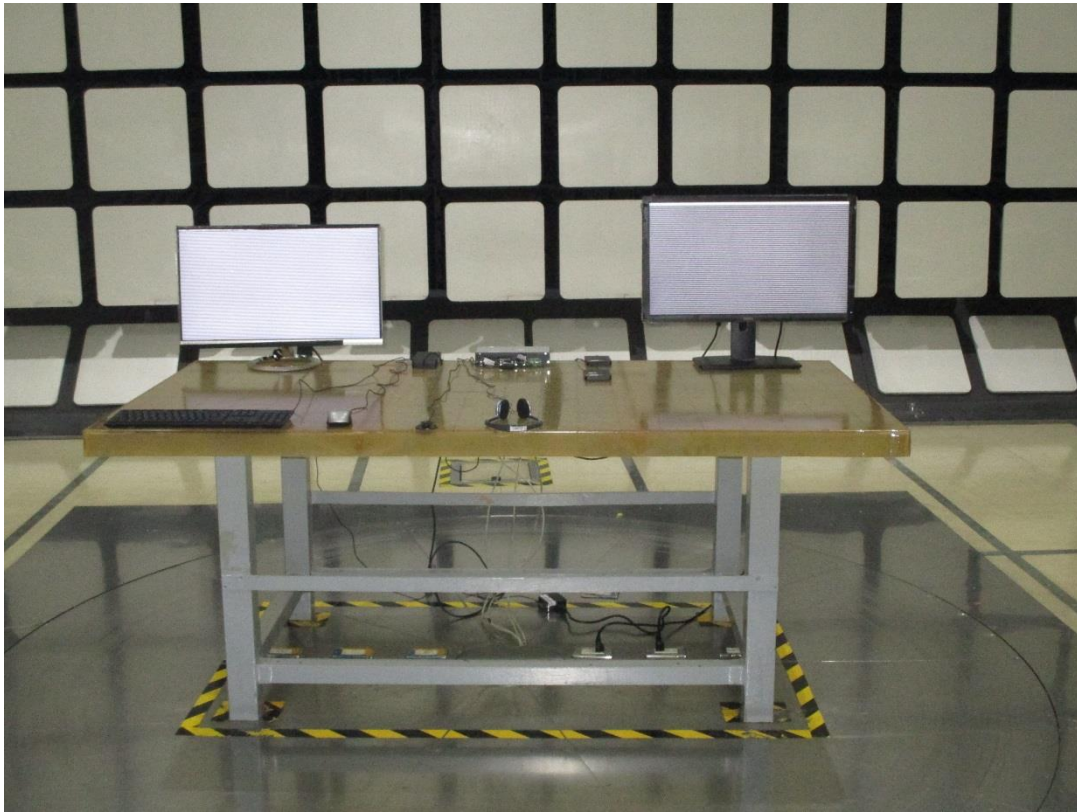


8 Pictures of Test Arrangements

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.

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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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