

## FCC Verification Test Report

**Report No.:** FV150810D07

**Test Model:** MTC-2021

**Series Model:** Vecow MTC Series; MTC-4021-PoE650U; MTC-4021-PoE350U;  
MTC-4015-PoE650U; MTC-4015-PoE350U;  
MTC-XXXXXXXXXXXXXXXXXXXXX  
("X" can be 0-9, A-Z or blank for marketing purpose)

**Received Date:** Aug. 10, 2015

**Test Date:** Aug. 14 ~ 15, 2015

**Issued Date:** Aug. 25, 2015

**Applicant:** Vecow Co., Ltd.

**Address:** 12F., No. 111, Zhongcheng Rd., Tucheng Dist., New Taipei City 23674  
Taiwan (R. O. C.)

**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  
(R.O.C.)



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### Release Control Record

Issue No.	Description	Date Issued
FV150810D07	Original release.	Aug. 25, 2015



**1 Certificate of Conformity**

**Product:** Industrial Multi-Touch Panel PC

**Brand:** Vecow

**Test Model:** MTC-2021

**Series Model:** Vecow MTC Series; MTC-4021-PoE650U; MTC-4021-PoE350U;  
MTC-4015-PoE650U; MTC-4015-PoE350U; MTC-XXXXXXXXXXXXXXXXXXXXX  
("X" can be 0-9, A-Z or blank for marketing purpose)

**Sample Status:** Engineering sample

**Applicant:** Vecow Co., Ltd.

**Test Date:** Aug. 14 ~ 15, 2015

**Standards:** 47 CFR FCC Part 15, Subpart B, Class A  
ICES-003:2012 Issue 5, 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 :** Albee Chu , **Date:** Aug. 25, 2015  
Albee Chu / Specialist

**Approved by :** Henry Lai , **Date:** Aug. 25, 2015  
Henry Lai / Director

## 2 Summary of Test Results

47 CFR FCC Part 15, Subpart B / ICES-003:2012 Issue 5, 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 -23.02 dB at 0.54063 MHz	Pass
15.109	6.2.1	Radiated Emissions up to 1 GHz	Minimum passing Class A margin is -3.12 dB at 42.05 MHz	Pass
	6.2.2	Radiated Emissions above 1 GHz	Minimum passing Class A margin is -16.33 dB at 1539.98 MHz	Pass

Note: There is no deviation to the applied test methods and requirements covered by the scope of this report.

### 2.1 Measurement Uncertainty

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

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	3.43 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.20 dB
Radiated Emissions above 1 GHz	Above 1GHz	3.36 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 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.

#### 3.2 General Description of EUT

Product	Industrial Multi-Touch Panel PC
Brand	Vecow
Product Name	MTC-2021
MT/Model No.	Vecow MTC Series; MTC-4021-PoE650U; MTC-4021-PoE350U; MTC-4015-PoE650U; MTC-4015-PoE350U; MTC-XXXXXXXXXXXXXXXXXXXXX ("X" can be 0-9, A-Z or blank for marketing purpose)
Hardware level	Engineering sample
Operating Software	WIN 7
Power Supply Rating	Switching power adapter Rating: refer to note below
Accessory Device	Adapter
Data Cable Supplied	N/A

Note:

- The EUT is an Industrial Multi-Touch Panel PC with the resolution up to 1920 x 1080. And it has following interface:

- |                            |              |
|----------------------------|--------------|
| ◇ D-Sub                    | ◇ USB 3.0    |
| ◇ HDMI                     | ◇ USB 2.0 *2 |
| ◇ LAN *2 (10/100/1000Mbps) | ◇ CON *6     |
| ◇ Audio in                 | ◇ GPIO       |
| ◇ Audio out                | ◇ DC in      |

\* D-Sub & HDMI can't not display simultaneously

- The EUT was configured with the following key components:

Components	Brand	Model No.	Specification
<b>Panel</b>	AUO	T215HVN01.0	21.5"
<b>Touch Screen</b>	AbonTouch	AB-5821503132118210850	Projected Capacitive Multi Touch
<b>Control board</b>	EETI	MC162A11	Projected Capacitive Control board
<b>HDD</b>	ADATA	ASP600S3-32GM	2.5" SATA 6Gb/s SSD
<b>RAM</b>	Kingston	99U5469-045.A00LF	DDR3L 1333 SODIMM, up to 8GB
<b>Converter Board</b>	Atokin	CPCB-LD200	LED Driver board

- The EUT consumes power from a switching power adapter, which has several models could be chosen, as the following:

Brand	Model No.	Specification
FSP	FSP060-DBAE2	AC I/P: 100-240V 1.5A 50-60Hz DC O/P: 24Vdc 2.5A max. Non-shielded AC power cord (1.8m) Non-shielded DC cable(1.3m) with one ferrie core

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

1. The EUT is designed with AC power supply of 100-240V, 50/60Hz. For Radiated evaluation, 230V/50Hz (for EN 55022), 120V/60Hz (for FCC Part 15) had been covered during the pre-test. The worst radiated emission data was founded at **120V/60 Hz** and recorded in the applied test report.
2. The EUT was pre-tested with resolution 1920 x 1080 (60Hz) of the HDMI and D-Sub interfaces and the worst emission level was found under the **HDMI** interface. Therefore the EUT wastesting under the following modes:

Mode	Test Condition	Test Voltage
Conducted emission test		
1	HDMI, 1920 x 1080 (60Hz)	120V, 60Hz
Radiated test		
1	HDMI, 1920 x 1080 (60Hz)	120V, 60Hz

### 3.4 Test Program Used and Operation Descriptions

- a. Turned on the power of all equipment.
- b. Industrial Multi-Touch Panel PC (EUT) ran a test program (WINEMC) to enable all functions of EUT.
- c. EUT read and wrote messages to/ from HDD and ext. HDD.
- d. EUT sent and received messages to/ from Server PCs (kept in a remote area) via UTP LAN cables (10m each).
- e. EUT sent "H" messages to panel and ext. LCD monitor. Then they displayed "H" patterns on their screens simultaneously.
- f. EUT sent "1kHz audio" signal to earphone.
- g. EUT sent messages to modems.

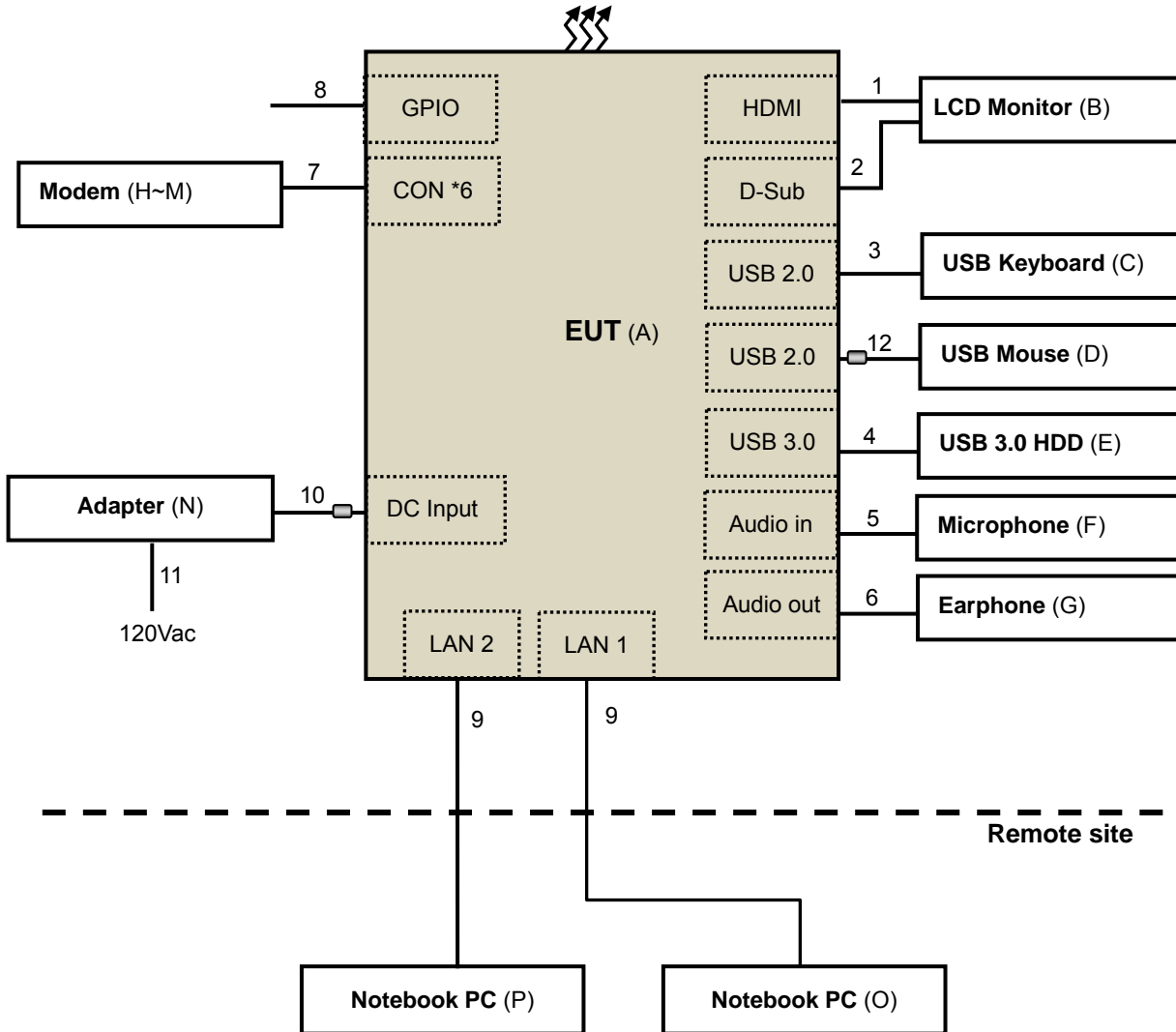
Steps c-g were repeated.

### 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 1.91 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.	EUT	Vecow	MTC-2021	-	-	-
B.	24" LCD MONITOR	DELL	U2410	CN082WXD72872 0CC0YTL	FCC DoC Approved	Provided by Lab
C.	USB Keyboard	BTC	5200U	G09302046360	E5XKB5122U	Supplied by client
D.	USB Mouse	Microsoft	1113	9170515772213	FCC DoC Approved	Supplied by client
E.	USB 3.0 Hard Disk	WD	WDBACY5000ABL- PESN	WX41A91C0320	FCC DoC Approved	Provided by Lab
F.	MICROPHONE	Labtec	mic-333	N/A	N/A	Provided by Lab
G.	EARPHONE	PHILIPS	SBC HL145	N/A	N/A	Provided by Lab
H.	MODEM	ACEEX	1414	0206026758	IFAXDM1414	Provided by Lab
I.	MODEM	ACEEX	1414	0206026751	IFAXDM1414	Provided by Lab
J.	MODEM	ACEEX	1414	980020508	IFAXDM1414	Provided by Lab
K.	MODEM	ACEEX	1414	980020520	IFAXDM1414	Provided by Lab
L.	MODEM	ACEEX	1414	980020540	IFAXDM1414	Provided by Lab
M.	MODEM	ACEEX	1414	980020505	IFAXDM1414	Provided by Lab
N.	Adapter	FSP	FSP060-DBAE2	N/A	FCC DoC Approved	Supplied by client
O.	Notebook PC	SONY	SVS151A12P	275548477001087	FCC DoC Approved	Provided by Lab
P.	Notebook PC	SONY	SVS151A12P	275548477001024	FCC DoC Approved	Provided by Lab

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	HDMI cable	1	2.0	Y	0	Provided by Lab
2.	D-Sub cable	1	1.8	Y	2	Provided by Lab
3.	USB cable	1	1.8	Y	0	Provided by Lab
4.	USB cable	1	0.5	Y	0	Provided by Lab
5.	Audio cable	1	2.4	N	0	Provided by Lab
6.	Audio cable	1	1.2	N	0	Provided by Lab
7.	RS232 cable	6	1.2	Y	0	Provided by Lab
8.	RS232 cable	1	1.7	Y	0	Provided by Lab
9.	LAN cable	2	10	N	0	Provided by Lab
10.	DC cable	1	1.3	N	1	Supplied by client
11.	AC power cord	1	1.8	N	0	Supplied by client
12.	USB cable	1	1.8	Y	1	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

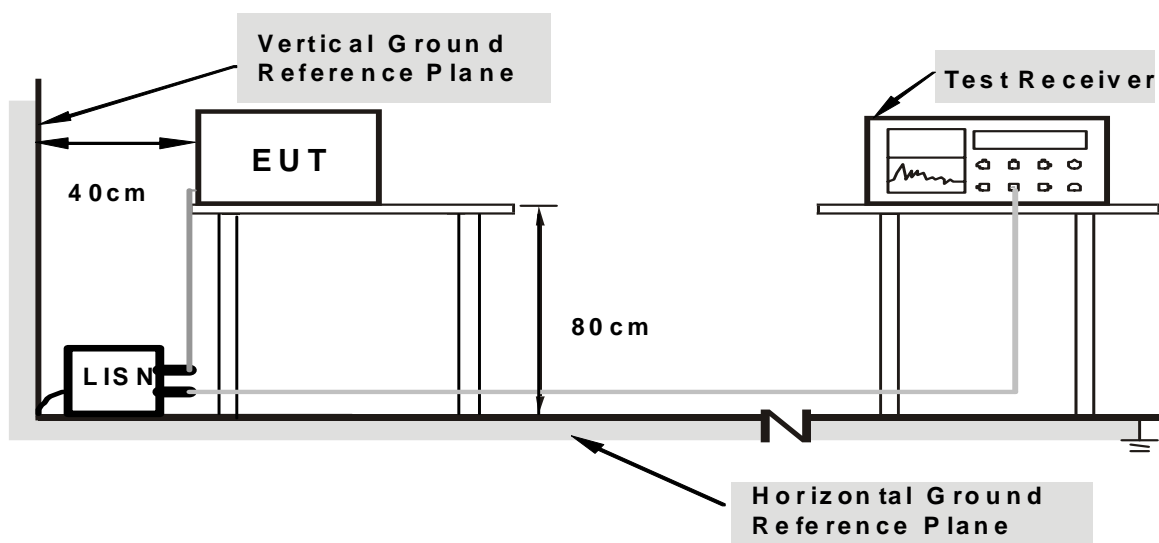
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ TEST RECEIVER	ESCS 30	100290	Dec. 27, 2014	Dec. 26, 2015
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ESH2-Z5	100104	Dec. 04, 2014	Dec. 03, 2015
LISN With Adapter (for EUT)	AD10	C09Ada-001	Dec. 04, 2014	Dec. 03, 2015
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	847265/023	Oct. 21, 2014	Oct. 20, 2015
SCHWARZBECK Artificial Mains Network (For EUT)	NNLK8129	8129229	May 06, 2015	May 05, 2016
Software	Cond_V7.3.7	NA	NA	NA
RF cable (JYEBAO)	5D-FB	Cable-C09.01	Feb. 24, 2015	Feb. 23, 2016
SUHNER Terminator (For ROHDE & SCHWARZ LISN)	65BNC-5001	E1-010789	May 19, 2015	May 18, 2016
ROHDE & SCHWARZ Artificial Mains Network (For TV EUT)	ESH3-Z5	100220	Nov. 20, 2014	Nov. 19, 2015
LISN With Adapter (for TV EUT)	100220	N/A	Nov. 20, 2014	Nov. 19, 2015

Notes: 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. 9.  
3. The VCCI Site Registration No. C-1312.  
4. Tested Date: Aug. 15, 2015.

### 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.

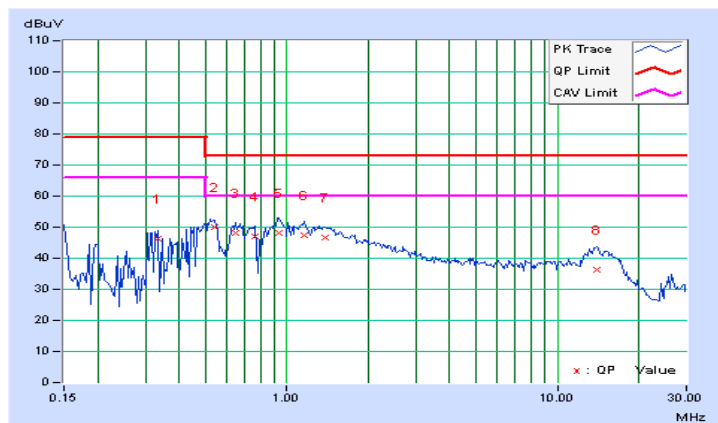
### 5.4 Test Results

<b>Frequency Range</b>	150kHz ~ 30MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9kHz
<b>Input Power</b>	120Vac, 60Hz	<b>Environmental Conditions</b>	25°C, 70%RH
<b>Tested by</b>	Kobe Lu		
<b>Test Mode</b>	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	0.33359	0.25	45.89	35.07	46.14	35.32	79.00	66.00	-32.86	-30.68
<b>2</b>	<b>0.54063</b>	<b>0.29</b>	<b>49.69</b>	<b>36.42</b>	<b>49.98</b>	<b>36.71</b>	<b>73.00</b>	<b>60.00</b>	<b>-23.02</b>	<b>-23.29</b>
3	0.65000	0.31	47.79	34.63	48.10	34.94	73.00	60.00	-24.90	-25.06
4	0.76719	0.33	46.54	29.79	46.87	30.12	73.00	60.00	-26.13	-29.88
5	0.93906	0.36	47.74	33.28	48.10	33.64	73.00	60.00	-24.90	-26.36
6	1.16406	0.38	47.05	34.51	47.43	34.89	73.00	60.00	-25.57	-25.11
7	1.39063	0.41	46.26	33.17	46.67	33.58	73.00	60.00	-26.33	-26.42
8	14.05078	0.92	35.53	30.09	36.45	31.01	73.00	60.00	-36.55	-28.99

**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

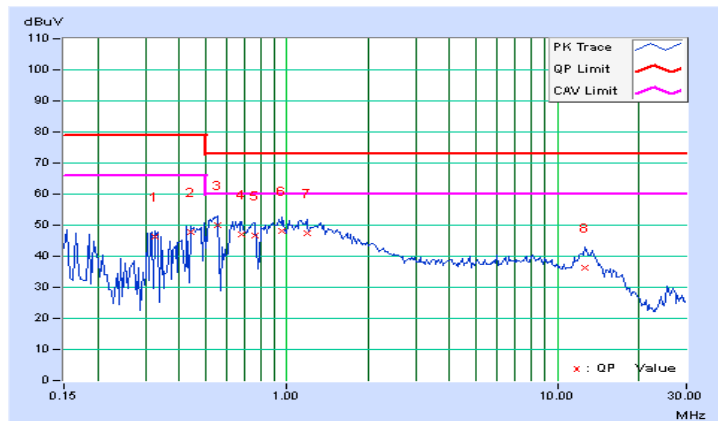


<b>Frequency Range</b>	150kHz ~ 30MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9kHz
<b>Input Power</b>	120Vac, 60Hz	<b>Environmental Conditions</b>	25°C, 70%RH
<b>Tested by</b>	Kobe Lu		
<b>Test Mode</b>	Mode 1		

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	0.32578	0.26	45.93	36.00	46.19	36.26	79.00	66.00	-32.81	-29.74
2	0.43906	0.29	47.64	36.01	47.93	36.30	79.00	66.00	-31.07	-29.70
3	0.55234	0.31	49.63	36.52	49.94	36.83	73.00	60.00	-23.06	-23.17
4	0.68125	0.33	46.66	35.88	46.99	36.21	73.00	60.00	-26.01	-23.79
5	0.76719	0.34	46.27	29.63	46.61	29.97	73.00	60.00	-26.39	-30.03
6	0.96250	0.37	47.90	33.16	48.27	33.53	73.00	60.00	-24.73	-26.47
7	1.18359	0.40	46.99	33.43	47.39	33.83	73.00	60.00	-25.61	-26.17
8	12.66797	0.80	35.56	30.16	36.36	30.96	73.00	60.00	-36.64	-29.04

**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





## 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 $\mu$ 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				
960-1000	49.5	43.5	47	37

Radiated Emissions Limits at 3 meters (dB $\mu$ 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				
960-1000	60	54	57.5	47.5

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

### 6.2 Test Instruments

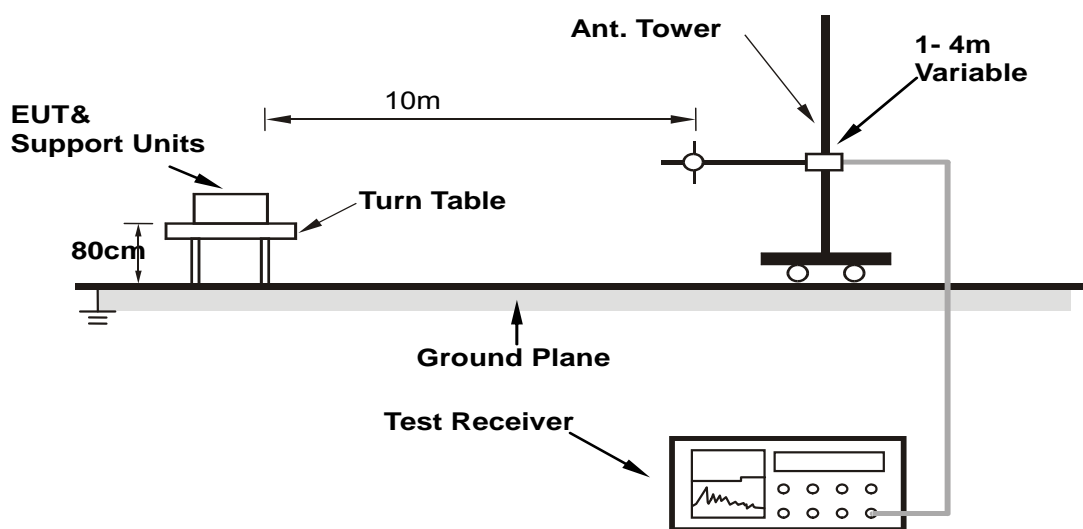
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ TEST RECEIVER	ESCS 30	845552/004	Aug. 25, 2014	Aug. 24, 2015
Schaffner Bilog Antenna	CBL6111D	22262	Feb. 11, 2015	Feb. 10, 2016
ADT. Turn Table	TT100	0205	NA	NA
ADT. Tower	AT100	0205	NA	NA
Software	Radiated_V7.6.15.9.4	NA	NA	NA
ADT RF Switches BOX	EMH-011	1001	Oct. 31, 2014	Oct. 30, 2015
WOKEN RF cable	8D	CABLE-ST2-01	Oct. 31, 2014	Oct. 30, 2015

- Notes:
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 Open Site No. 2.
  3. The VCCI Site Registration No. R-237.
  4. The FCC Site Registration No. 90424.
  5. Tested Date: Aug. 15, 2015.

### 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 up to 1 GHz.

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



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

### 6.4 Test Results

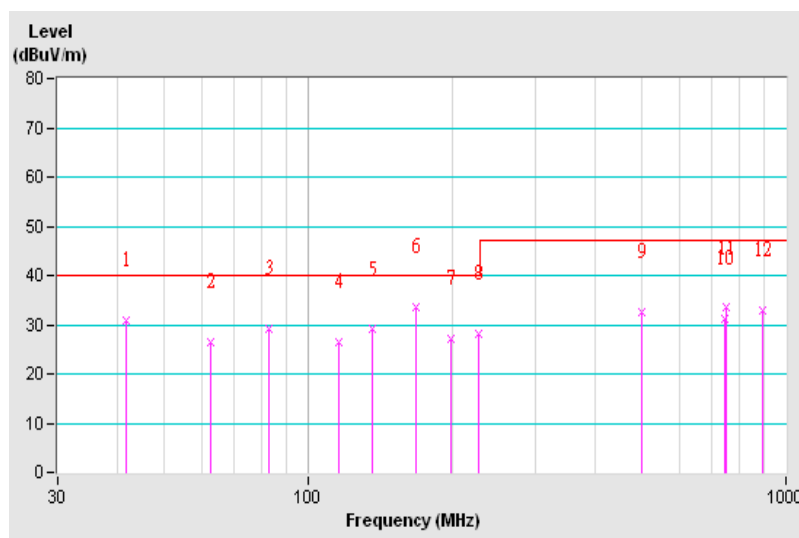
<b>Frequency Range</b>	30MHz ~ 1GHz	<b>Detector Function &amp; Bandwidth</b>	Quasi-Peak (QP), 120kHz
<b>Tested by</b>	Adam Chen	<b>Environmental Conditions</b>	34°C, 61%RH
<b>Test Mode</b>	Mode 1		

**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	41.81	30.92 QP	40.00	-9.08	4.00 H	227	17.94	12.98
2	62.76	26.40 QP	40.00	-13.60	4.00 H	132	19.12	7.28
3	82.84	29.19 QP	40.00	-10.81	4.00 H	178	19.94	9.25
4	115.98	26.55 QP	40.00	-13.45	4.00 H	302	13.32	13.23
5	136.56	29.00 QP	40.00	-11.00	4.00 H	231	15.40	13.60
6	168.28	33.65 QP	40.00	-6.35	4.00 H	343	21.55	12.10
7	199.96	27.04 QP	40.00	-12.96	4.00 H	249	15.73	11.31
8	227.32	28.12 QP	40.00	-11.88	4.00 H	37	15.27	12.85
9	500.02	32.47 QP	47.00	-14.53	1.69 H	221	9.28	23.19
10	742.52	31.30 QP	47.00	-15.70	1.14 H	195	3.22	28.08
11	750.01	33.45 QP	47.00	-13.55	1.00 H	163	5.38	28.07
12	891.02	33.01 QP	47.00	-13.99	1.00 H	165	3.72	29.29

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



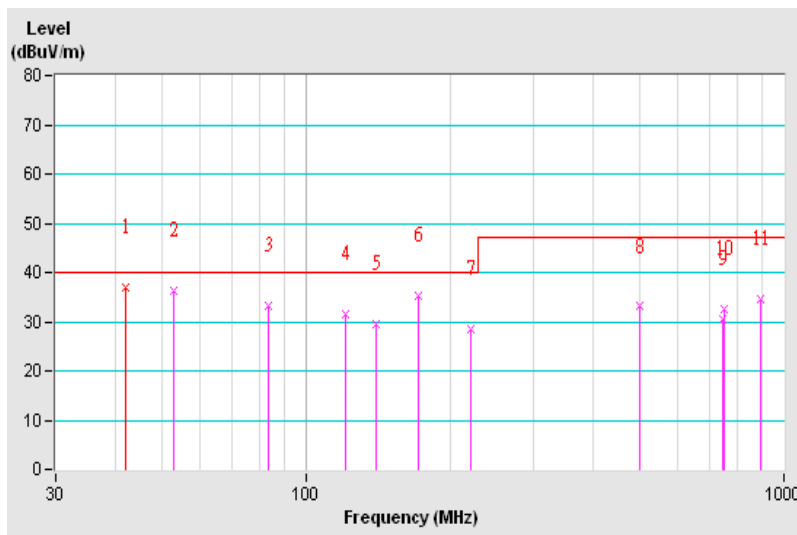


<b>Frequency Range</b>	30MHz ~ 1GHz	<b>Detector Function &amp; Bandwidth</b>	Quasi-Peak (QP), 120kHz
<b>Tested by</b>	Adam Chen	<b>Environmental Conditions</b>	34°C, 61%RH
<b>Test Mode</b>	Mode 1		

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	42.05	36.88 QP	40.00	-3.12	1.00 V	104	24.06	12.82
2	52.96	36.44 QP	40.00	-3.56	1.00 V	120	28.36	8.08
3	83.76	33.31 QP	40.00	-6.69	1.00 V	336	23.85	9.46
4	120.70	31.51 QP	40.00	-8.49	1.00 V	0	18.03	13.48
5	140.24	29.41 QP	40.00	-10.59	1.00 V	85	15.62	13.79
6	171.40	35.29 QP	40.00	-4.71	1.00 V	13	23.31	11.98
7	221.21	28.64 QP	40.00	-11.36	1.00 V	55	16.28	12.36
8	500.01	33.09 QP	47.00	-13.91	2.27 V	0	9.90	23.19
9	742.47	30.53 QP	47.00	-16.47	3.65 V	291	2.45	28.08
10	750.04	32.66 QP	47.00	-14.34	2.89 V	111	4.59	28.07
11	891.02	34.67 QP	47.00	-12.33	1.72 V	226	5.38	29.29

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 $\mu$ 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 $\mu$ 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 $\mu$ 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

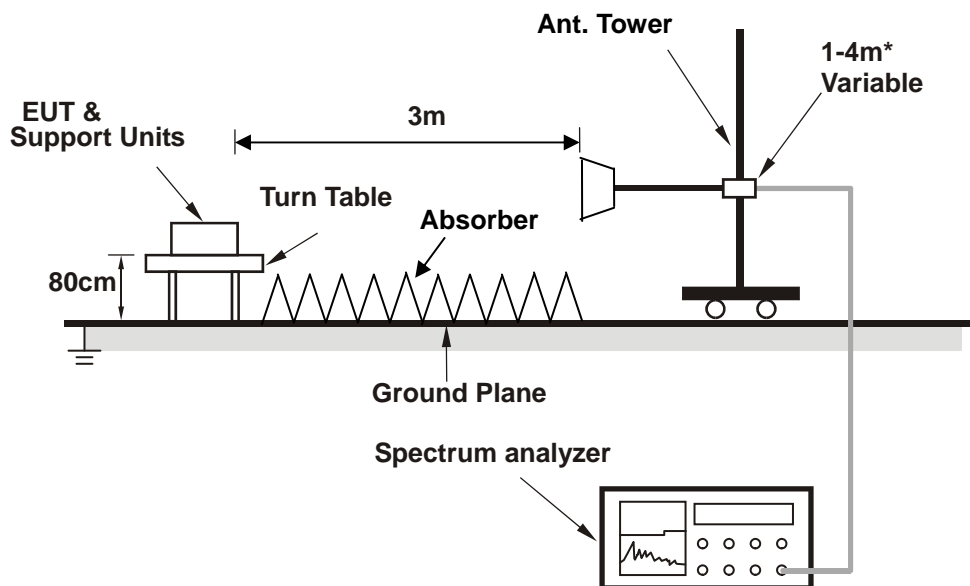
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Agilent Spectrum	E4446A	MY51100009	May 30, 2015	May 29, 2016
Agilent Test Receiver	N9038A	MY51210137	Jul. 13, 2015	Jul. 12, 2016
Agilent Preamplifier	8449B	3008A01292	Feb. 26, 2015	Feb. 25, 2016
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Mar. 01, 2015	Feb. 28, 2016
EMCI Preamplifier	EMC184045B	980235	Mar. 01, 2015	Feb. 28, 2016
Schwarzbeck Horn Antenna	BBHA-9170	212	Feb. 09, 2015	Feb. 08, 2016
EMCO Horn Antenna	3115	6714	Feb. 06, 2015	Feb. 05, 2016
Max Full. Turn Table	MF7802	MF780208216	NA	NA
Software	Radiated_V8.7.07	NA	NA	NA
SUHNER RF cable	SF106-18	Cable-CH10	Aug. 15, 2014	Aug. 14, 2015
SUHNER RF cable	SF102	Cable-CH8-3.6m	Aug. 15, 2014	Aug. 14, 2015

- Notes:
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. 10.
  3. The Industry Canada Reference No. IC 7450E-11.
  4. The VCCI Site Registration No. G-427
  5. The FCC Site Registration No. 367016
  6. Tested Date: Aug. 14, 2015.

### 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

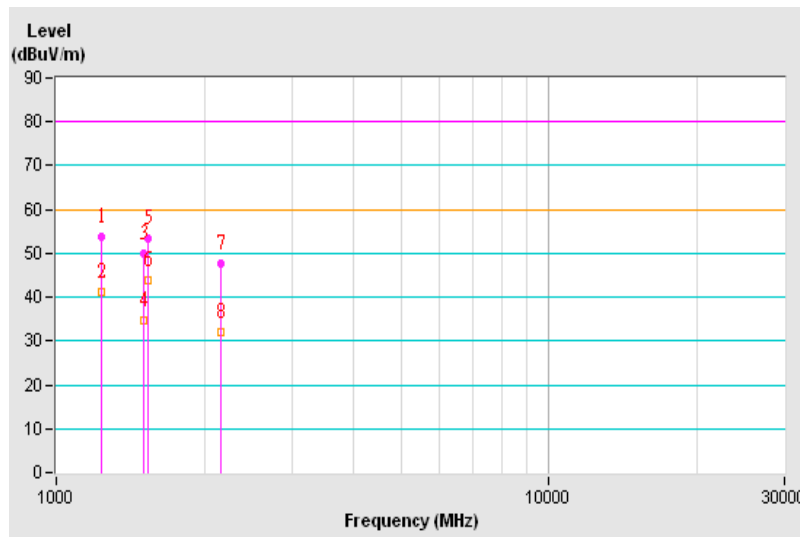
<b>Frequency Range</b>	1GHz ~ 9.6GHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Peak (PK) / Average (AV), 1MHz
<b>Tested by</b>	Kobe Lu	<b>Environmental Conditions</b>	26°C, 73%RH
<b>Test Mode</b>	Mode 1		

**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	1232.05	53.75 PK	80.00	-26.25	1.20 H	190	62.53	-8.78
2	1232.05	41.25 AV	60.00	-18.75	1.20 H	190	50.03	-8.78
3	1500.00	50.05 PK	80.00	-29.95	1.32 H	179	57.63	-7.58
4	1500.00	34.63 AV	60.00	-25.37	1.32 H	179	42.21	-7.58
5	1539.98	53.48 PK	80.00	-26.52	1.75 H	176	60.86	-7.38
<b>6</b>	<b>1539.98</b>	<b>43.67 AV</b>	<b>60.00</b>	<b>-16.33</b>	<b>1.75 H</b>	<b>176</b>	<b>51.05</b>	<b>-7.38</b>
7	2156.04	47.51 PK	80.00	-32.49	1.00 H	313	52.47	-4.96
8	2156.04	32.13 AV	60.00	-27.87	1.00 H	313	37.09	-4.96

**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

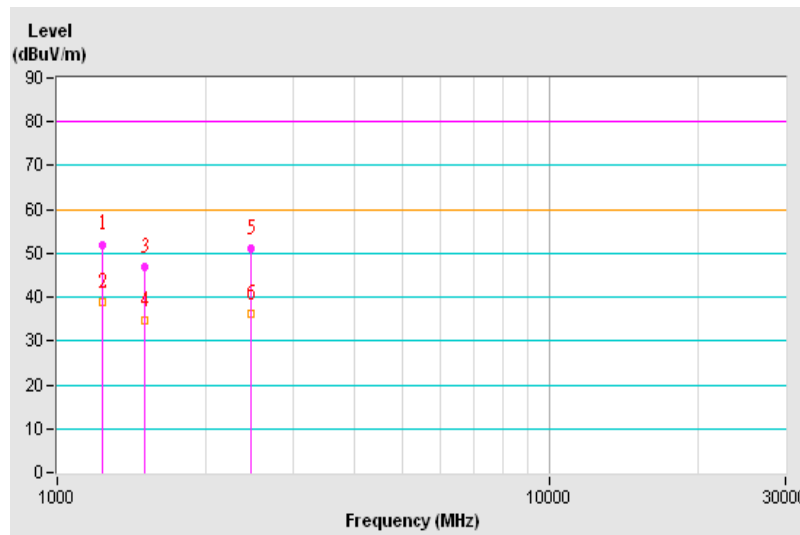


<b>Frequency Range</b>	1GHz ~ 9.6GHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Peak (PK) / Average (AV), 1MHz
<b>Tested by</b>	Kobe Lu	<b>Environmental Conditions</b>	26°C, 73%RH
<b>Test Mode</b>	Mode 1		

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	1232.03	52.04 PK	80.00	-27.96	1.55 V	229	60.82	-8.78
2	1232.03	38.89 AV	60.00	-21.11	1.55 V	229	47.67	-8.78
3	1500.03	46.93 PK	80.00	-33.07	1.23 V	8	54.51	-7.58
4	1500.03	34.73 AV	60.00	-25.27	1.23 V	8	42.31	-7.58
5	2464.01	50.96 PK	80.00	-29.04	1.00 V	217	54.92	-3.96
6	2464.01	36.20 AV	60.00	-23.80	1.00 V	217	40.16	-3.96

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 on 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 accredited and approved 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](http://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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