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# FCC TEST REPORT

**REPORT NO.:** RF120831C18  
**MODEL NO.:** 62220-02  
**FCC ID:** ZHK-62220-02  
**RECEIVED:** Aug. 31, 2012  
**TESTED:** Sep. 04 ~ Sep. 05, 2012  
**ISSUED:** Sep. 17, 2012

**APPLICANT:** SteelSeries ApS

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IL 60661

**ISSUED BY:** Bureau Veritas Consumer Products Services  
(H.K.) Ltd., Taoyuan Branch

**LAB ADDRESS:** No. 47, 14th Ling, Chia Pau Vil., Lin Kou Dist.,  
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**TEST LOCATION:** No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei  
Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

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## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF120831C18	Original release	Sep. 17, 2012



## 1. CERTIFICATION

**PRODUCT:** WORLD OF WARCRAFT WIRELESS MMO MOUSE  
CHARGER STAND

**MODEL NO.:** 62220-02

**BRAND:** STEELSERIES

**APPLICANT:** SteelSeries ApS

**TESTED:** Sep. 04 ~ Sep. 05, 2012

**TEST SAMPLE:** ENGINEERING SAMPLE

**STANDARDS:** FCC Part 15, Subpart C (Section 15.249)  
ANSI C63.10-2009

The above equipment (model: 62220-02) 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 : Sep. 17, 2012  
Polly Chien / Specialist

APPROVED BY :  , DATE : Sep. 17, 2012  
Ken Liu / Manager

## 2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C (Section 15.249)			
STANDARD PARAGRAPH	TEST TYPE	RESULT	REMARK
15.207	Conducted Emission Test	PASS	Meet the requirement of limit. Minimum passing margin is -8.85dB at 4.03789MHz.
15.209 15.249 15.249 (d)	Radiated Emission Test Band Edge Measurement Limit: 50dB less than the peak value of fundamental frequency or meet radiated emission limit in section 15.209	PASS	Meet the requirement of limit. Minimum passing margin is -3.6dB at 99.75MHz.

### 2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	9kHz~30MHz	2.44 dB
Radiated emission	30MHz ~ 200MHz	3.19 dB
	200MHz ~1000MHz	3.21 dB
	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

<b>EUT</b>	WORLD OF WARCRAFT WIRELESS MMO MOUSE CHARGER STAND
<b>MODEL NO.</b>	62220-02
<b>POWER SUPPLY</b>	5.0Vdc (host equipment)
<b>MODULATION TYPE</b>	GFSK
<b>DATA RATE</b>	2M bit/sec
<b>OPERATING FREQUENCY</b>	2404 ~ 2479MHz
<b>NUMBER OF CHANNEL</b>	26
<b>ANTENNA TYPE</b>	Printed antenna with 1.53 dBi gain
<b>DATA CABLE</b>	2.0m shielded USB cable without core
<b>I/O PORT</b>	USB
<b>ACCESSORY DEVICES</b>	N/A

**NOTE:**

1. The function of the USB port is for changing only,
2. The above EUT information is declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.



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### 3.2 DESCRIPTION OF TEST MODES

26 channels are provided to this EUT:

CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)
1	2404	14	2443
2	2407	15	2446
3	2410	16	2449
4	2413	17	2452
5	2416	18	2455
6	2419	19	2458
7	2422	20	2461
8	2425	21	2464
9	2428	22	2467
10	2431	23	2470
11	2434	24	2473
12	2437	25	2476
13	2440	26	2479

### 3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE $\geq$ 1G	RE $<$ 1G	PLC	BM	
-	√	√	√	√	-

Where **RE $<$ 1G**: Radiated Emission below 1GHz      **RE $\geq$ 1G**: Radiated Emission above 1GHz  
**PLC**: Power Line Conducted Emission      **BM**: Bandedge Measurement

#### RADIATED EMISSION TEST (ABOVE 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations axis and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	1 to 26	1, 13, 26	GFSK

#### RADIATED EMISSION TEST (BELOW 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations axis and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	1 to 26	26	GFSK

#### POWER LINE CONDUCTED EMISSION TEST:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	1 to 26	26	GFSK





**BANDEDGE MEASUREMENT:**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	1 to 26	1, 13, 26	GFSK

**TEST CONDITION:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE≥1G	24deg. C, 66%RH	120Vac, 60Hz	Alan Wu
RE<1G	24deg. C, 66%RH	120Vac, 60Hz	Brad Wu
PLC	25deg. C, 68%RH	120Vac, 60Hz	Mark Liao
BM	25deg. C, 65%RH	120Vac, 60Hz	Aska Huang

**3.3 DESCRIPTION OF SUPPORT UNITS**

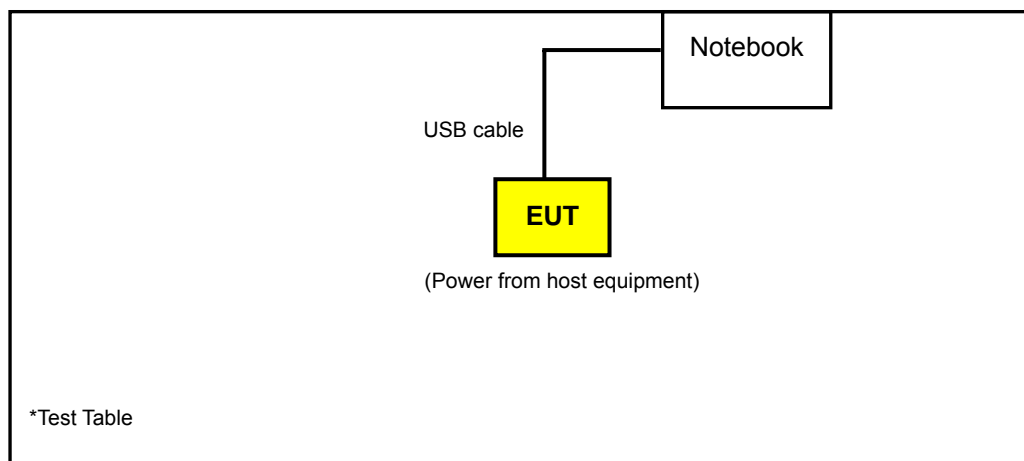
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK	DELL	E5420	BPQ8MQ1	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA

**NOTE:** All power cords of the above support units are non shielded (1.8m).

### 3.3.1 CONFIGURATION OF SYSTEM UNDER TEST



### 3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC Part 15, Subpart C (Section 15.249)**

ANSI C63.10-2009

All test items have been performed and recorded as per the above standards.

**NOTE:** The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

## 4. TEST TYPES AND RESULTS

### 4.1 RADIATED EMISSION AND BAND EDGE MEASUREMENT

#### 4.1.1 LIMITS OF RADIATED EMISSION AND BAND EDGE MEASUREMENT

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902 ~ 928 MHz	50	500
2400 ~ 2483.5 MHz	50	500
5725 ~ 5875 MHz	50	500
24 ~ 24.25 GHz	250	2500

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits as below table, whichever is the lesser attenuation

Frequencies (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

#### NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. 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.

#### 4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESI7	838496/016	Jan. 03, 2012	Jan. 02, 2013
Spectrum Analyzer ROHDE & SCHWARZ	FSP 40	100039	Feb. 03, 2012	Feb. 02, 2013
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Apr. 06, 2012	Apr. 05, 2013
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-408	Jan. 05, 2012	Jan. 04, 2013
HORN Antenna SCHWARZBECK	BBHA 9170	148	Jul. 11, 2012	Jul. 10, 2013
Loop Antenna	HFH2-Z2	100070	Jan. 31, 2012	Jan. 30, 2014
Preamplifier Agilent	8449B	3008A01961	Oct. 29, 2011	Oct. 28, 2012
Preamplifier Agilent	8447D	2944A10738	Oct. 29, 2011	Oct. 28, 2012
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309220/4	Nov. 03, 2011	Nov. 02, 2012
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250724/4	Nov. 03, 2011	Nov. 02, 2012
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	295012/4	Nov. 03, 2011	Nov. 02, 2012
Software ADT	ADT_Radiated_ V7.6.15.9.2	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller inn-co GmbH	CO2000	019303	NA	NA
Turn Table ADT	TT100.	TT93021704	NA	NA
Turn Table Controller ADT	SC100.	SC93021704	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 calibration interval of the loop antenna is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
  3. The test was performed in HwaYa Chamber 4.
  4. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
  5. The FCC Site Registration No. is 460141.
  6. The IC Site Registration No. is IC7450F-4.

#### 4.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

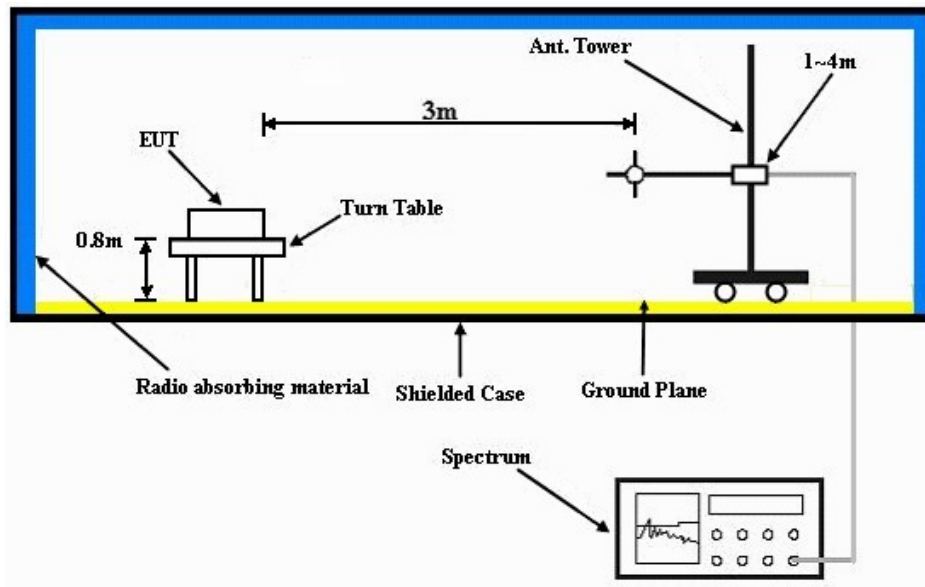
**NOTE:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.1.5 TEST SETUP



For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.1.6 EUT OPERATING CONDITIONS

Set the EUT under transmission condition continuously at specific channel frequency.



### 4.1.7 TEST RESULTS

#### ABOVE 1GHz DATA

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 66%RH	TESTED BY	Alan Wu

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	40.9 PK	74.0	-33.1	1.09 H	171	8.90	32.00
2	2390.00	29.2 AV	54.0	-24.8	1.09 H	171	-2.80	32.00
3	2398.00	44.7 PK	74.0	-29.3	1.09 H	171	12.70	32.00
4	2398.00	31.6 AV	54.0	-22.4	1.09 H	171	-0.40	32.00
5	2400.00	43.7 PK	74.0	-30.3	1.09 H	171	11.70	32.00
6	2400.00	17.6 AV	54.0	-36.4	1.09 H	171	-14.40	32.00
7	*2404.00	101.3 PK	114.0	-12.7	1.09 H	171	69.30	32.00
8	*2404.00	75.2 AV	94.0	-18.8	1.09 H	171	43.20	32.00
9	4808.00	54.8 PK	74.0	-19.2	1.05 H	152	16.50	38.30
10	4808.00	28.7 AV	54.0	-25.3	1.05 H	152	-9.60	38.30

#### 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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “ \* ” : Fundamental frequency
6. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:  
 $20 \log (\text{Duty cycle}) = 20 \log (4.95 \text{ ms} / 100 \text{ ms}) = -26.1 \text{ dB}$   
Please see page 19 for plotted duty.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 66%RH	TESTED BY	Alan Wu

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	39.9 PK	74.0	-34.1	1.55 V	222	7.90	32.00
2	2390.00	27.4 AV	54.0	-26.6	1.55 V	222	-4.60	32.00
3	2398.00	42.4 PK	74.0	-31.6	1.55 V	222	10.40	32.00
4	2398.00	29.1 AV	54.0	-24.9	1.55 V	222	-2.90	32.00
5	2400.00	40.5 PK	74.0	-33.5	1.55 V	222	8.50	32.00
6	2400.00	14.4 AV	54.0	-39.6	1.55 V	222	-17.60	32.00
7	*2404.00	95.5 PK	114.0	-18.5	1.55 V	222	63.50	32.00
8	*2404.00	69.4 AV	94.0	-24.6	1.55 V	222	37.40	32.00
9	4808.00	54.5 PK	74.0	-19.5	1.00 V	196	16.20	38.30
10	4808.00	28.4 AV	54.0	-25.6	1.00 V	196	-9.90	38.30

**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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “ \* “ : Fundamental frequency
6. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:  
$$20 \log (\text{Duty cycle}) = 20 \log (4.95 \text{ ms} / 100 \text{ ms}) = -26.1 \text{ dB}$$
Please see page 19 for plotted duty.





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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 13	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 66%RH	TESTED BY	Alan Wu

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2440.00	100.4 PK	114.0	-13.6	1.05 H	170	68.30	32.10
2	*2440.00	74.3 AV	94.0	-19.7	1.05 H	170	42.20	32.10
3	4880.00	56.4 PK	74.0	-17.6	1.61 H	73	17.90	38.50
4	4880.00	30.3 AV	54.0	-23.7	1.61 H	73	-8.20	38.50
5	7320.00	58.9 PK	74.0	-15.1	1.65 H	277	14.50	44.40
6	7320.00	32.8 AV	54.0	-21.2	1.65 H	277	-11.60	44.40
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2440.00	93.8 PK	114.0	-20.2	1.62 V	125	61.70	32.10
2	*2440.00	67.7 AV	94.0	-26.3	1.62 V	125	35.60	32.10
3	4880.00	55.0 PK	74.0	-19.0	1.00 V	337	16.50	38.50
4	4880.00	28.9 AV	54.0	-25.1	1.00 V	337	-9.60	38.50
5	7320.00	57.7 PK	74.0	-16.3	1.00 V	177	13.30	44.40
6	7320.00	31.6 AV	54.0	-22.4	1.00 V	177	-12.80	44.40

**REMARKS:**

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “ \* “ : Fundamental frequency
6. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:  
 $20 \log (\text{Duty cycle}) = 20 \log (4.95 \text{ ms} / 100 \text{ ms}) = -26.1 \text{ dB}$   
Please see page 19 for plotted duty.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 26	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 66%RH	TESTED BY	Alan Wu

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2479.00	102.6 PK	114.0	-11.4	1.33 H	171	70.30	32.30
2	*2479.00	76.5 AV	94.0	-17.5	1.33 H	171	44.20	32.30
3	2483.50	43.4 PK	74.0	-30.6	1.33 H	171	11.10	32.30
4	2483.50	17.3 AV	54.0	-36.7	1.33 H	171	-15.00	32.30
5	2485.50	43.4 PK	74.0	-30.6	1.33 H	171	11.10	32.30
6	2485.50	31.0 AV	54.0	-23.0	1.33 H	171	-1.30	32.30
7	4958.00	56.7 PK	74.0	-17.3	1.56 H	72	18.30	38.40
8	4958.00	30.6 AV	54.0	-23.4	1.56 H	72	-7.80	38.40

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

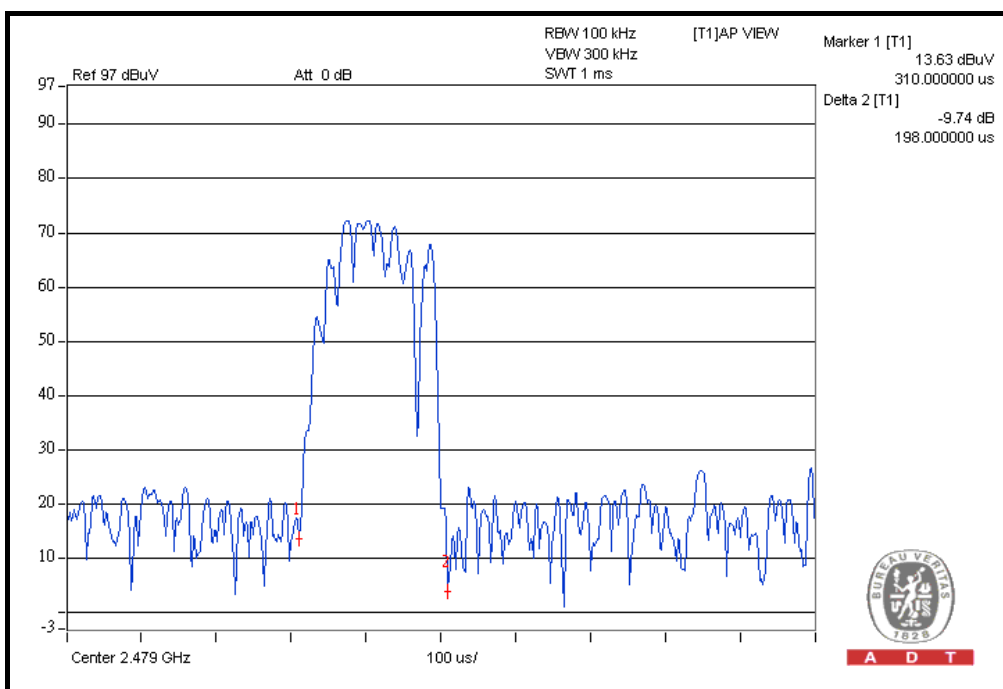
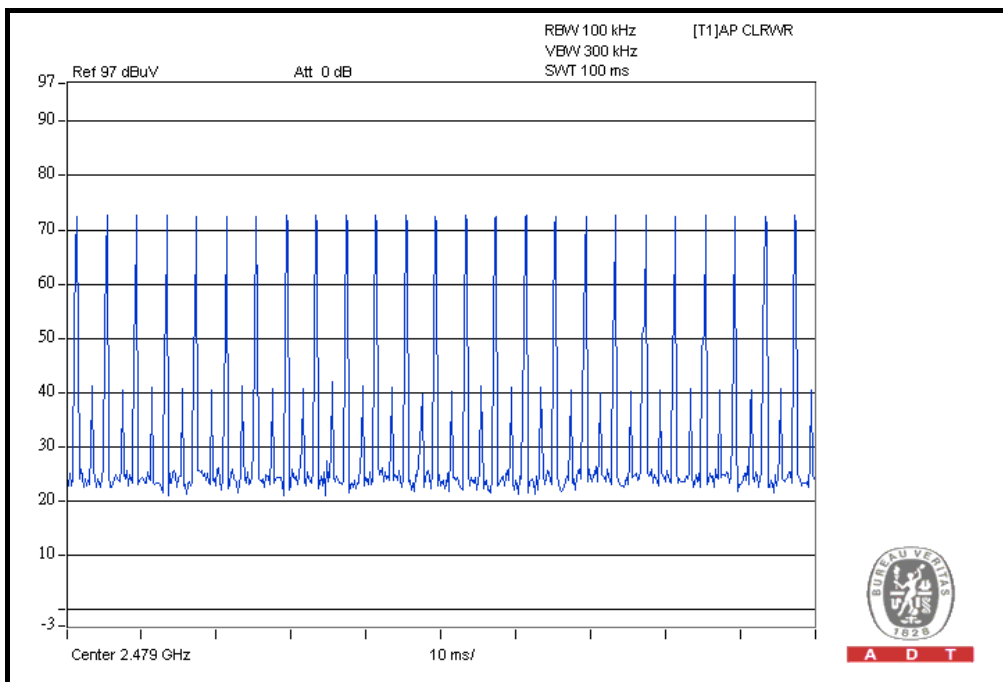
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2479.00	93.8 PK	114.0	-20.2	1.64 V	127	61.50	32.30
2	*2479.00	67.7 AV	94.0	-26.3	1.64 V	127	35.40	32.30
3	2483.50	40.4 PK	74.0	-33.6	1.64 V	127	8.10	32.30
4	2483.50	14.3 AV	54.0	-39.7	1.64 V	127	-18.00	32.30
5	2485.50	41.4 PK	74.0	-32.6	1.64 V	127	9.10	32.30
6	2485.50	29.0 AV	54.0	-25.0	1.64 V	127	-3.30	32.30
7	4958.00	55.3 PK	74.0	-18.7	1.00 V	327	16.90	38.40
8	4958.00	29.2 AV	54.0	-24.8	1.00 V	327	-9.20	38.40

**REMARKS:**

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “ \* “ : Fundamental frequency
6. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:  
 $20 \log (\text{Duty cycle}) = 20 \log (4.95 \text{ ms} / 100 \text{ ms}) = -26.1 \text{ dB}$   
Please see page 19 for plotted duty.



A D T



$$20 \log (\text{Duty cycle}) = 20 \log (25 \times 0.198 \text{ ms} / 100 \text{ ms}) = -26.1 \text{ dB}$$



**BELOW 1GHz WORST-CASE DATA**

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 26	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	24deg. C, 66%RH	TESTED BY	Brad Wu

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	45.42	31.5 QP	40.0	-8.5	1.99 H	196	17.50	14.00
2	99.75	39.9 QP	43.5	-3.6	1.99 H	252	30.50	9.40
3	239.46	31.7 QP	46.0	-14.3	1.00 H	286	19.20	12.50
4	299.62	30.5 QP	46.0	-15.5	1.00 H	75	15.80	14.70
5	431.56	31.2 QP	46.0	-14.8	1.74 H	274	13.30	17.90
6	666.35	35.8 QP	46.0	-10.2	1.24 H	252	13.80	22.00
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	45.42	29.5 QP	40.0	-10.5	1.00 V	287	15.50	14.00
2	99.75	32.2 QP	43.5	-11.3	2.00 V	342	22.80	9.40
3	336.48	27.8 QP	46.0	-18.2	1.50 V	260	12.20	15.60
4	431.56	28.9 QP	46.0	-17.1	1.50 V	319	11.00	17.90
5	664.41	29.8 QP	46.0	-16.2	1.50 V	172	7.90	21.90
6	839.05	28.0 QP	46.0	-18.0	1.50 V	17	2.90	25.10

**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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.

## 4.2 CONDUCTED EMISSION MEASUREMENT

### 4.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB $\mu$ V)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	60	50

- NOTE:**
1. The lower limit shall apply at the transition frequencies.
  2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.
  3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

### 4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCS30	100291	Nov. 23, 2011	Nov. 22, 2012
RF signal cable Woken	5D-FB	Cable-HYC01-01	Dec. 29, 2011	Dec. 28, 2012
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Jul. 02, 2012	Jul. 01, 2013
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 07, 2012	Feb. 06, 2013
Software ADT	BV ADT_Cond_ V7.3.7.3	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 1.
  3. The VCCI Site Registration No. is C-2040.

#### 4.2.3 TEST PROCEDURES

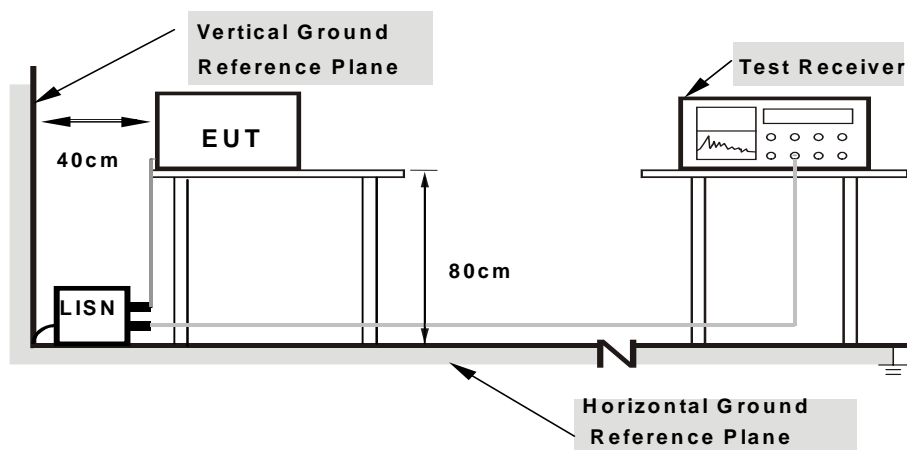
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

**NOTE:** All modes of operation were investigated and the worst-case emissions are reported.

#### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.2.5 TEST SETUP



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

For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.2.6 EUT OPERATING CONDITIONS

Same as 4.1.6.

### 4.2.7 TEST RESULTS

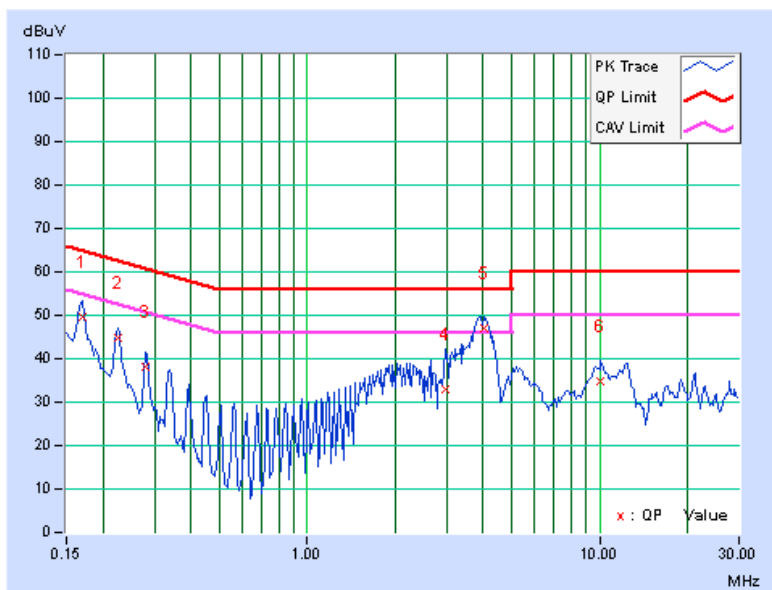
#### CONDUCTED WORST-CASE DATA :

PHASE	Line 1	6dB BANDWIDTH	9kHz
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16953	0.17	49.61	43.12	49.78	43.29	64.98	54.98	-15.20	-11.69
2	0.22422	0.22	44.60	37.15	44.82	37.37	62.66	52.66	-17.84	-15.29
3	0.27891	0.20	37.89	32.70	38.09	32.90	60.85	50.85	-22.76	-17.95
4	2.97020	0.29	32.60	25.08	32.89	25.37	56.00	46.00	-23.11	-20.63
<b>5</b>	<b>4.03789</b>	<b>0.34</b>	<b>46.81</b>	<b>34.92</b>	<b>47.15</b>	<b>35.26</b>	<b>56.00</b>	<b>46.00</b>	<b>-8.85</b>	<b>-10.74</b>
6	10.03797	0.57	34.42	31.87	34.99	32.44	60.00	50.00	-25.01	-17.56

#### 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.

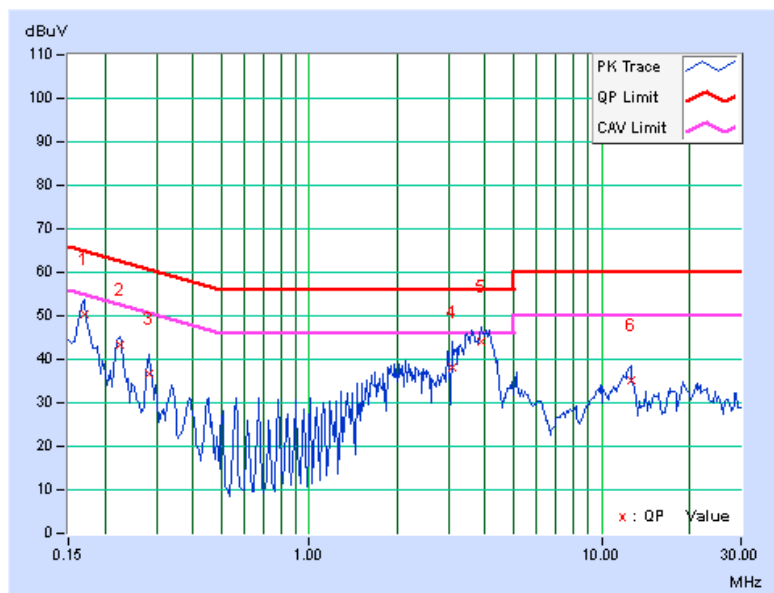


PHASE	Line 2	6dB BANDWIDTH	9kHz
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16949	0.26	50.26	44.02	50.52	44.28	64.99	54.99	-14.46	-10.70
2	0.22422	0.30	42.87	35.36	43.17	35.66	62.66	52.66	-19.49	-17.00
3	0.28281	0.29	36.25	31.72	36.54	32.01	60.73	50.73	-24.20	-18.73
4	3.08203	0.40	37.81	28.05	38.21	28.45	56.00	46.00	-17.79	-17.55
5	3.86719	0.44	43.50	34.23	43.94	34.67	56.00	46.00	-12.06	-11.33
6	12.66016	0.74	34.37	30.74	35.11	31.48	60.00	50.00	-24.89	-18.52

**REMARKS:**

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





## 5. PHOTOGRAPHS OF THE TEST CONFIGURATION

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



## 6. 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:

**Linko EMC/RF Lab**

Tel: 886-2-26052180

Fax: 886-2-26051924

**Hsin Chu EMC/RF Lab**

Tel: 886-3-5935343

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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.

## **7. APPENDIX A – MODIFICATION RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB**

No any modifications are made to the EUT by the lab during the test.

---END---