



# FCC TEST REPORT

**REPORT NO. :** RF970803L02

**MODEL NO. :** 1353

**RECEIVED :** Aug. 04, 2008

**TESTED :** Aug. 04, ~ Aug. 07, 2008

**ISSUED :** Aug. 15, 2008

**APPLICANT :** Microsoft Corporation

**ADDRESS :** One Microsoft Way, Redmond WA 98052-6399,  
U.S.A

**ISSUED BY :** Advance Data Technology Corporation

**LAB ADDRESS :** No. 47, 14th Ling, Chia Pau Tsuen, Lin Kou  
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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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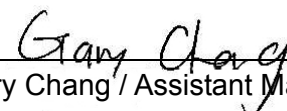
# 1. CERTIFICATION

**PRODUCT:** Microsoft® SideWinder™ 2.4GHz Transceiver  
**MODEL NO.:** 1353  
**BRAND:** Microsoft®  
**APPLICANT:** Microsoft Corporation  
**TESTED:** Aug. 04, ~ Aug. 07, 2008  
**TEST SAMPLE:** ENGINEERING SAMPLE  
**STANDARDS: FCC Part 15, Subpart C (Section 15.249)**  
ANSI C63.4-2003

The above equipment (model: 1353) have been tested by **Advance Data Technology Corporation**, 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** : Aug. 15, 2008  
Joanna Wang / Senior Specialist

**TECHNICAL ACCEPTANCE** :  , **DATE** : Aug. 15, 2008  
Responsible for RF Long Chen / Senior Engineer

**APPROVED BY** :  , **DATE** : Aug. 15, 2008  
Gary Chang / Assistant 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 -15.57dB at 0.172MHz.
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 -6.11dB at 43.510MHz.

### 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 emissions	30MHz ~ 200MHz	3.34 dB
	200MHz ~1000MHz	3.35 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>	Microsoft® SideWinder™ 2.4GHz Transceiver
<b>MODEL NO.</b>	1353
<b>FCC ID</b>	C3K1353
<b>POWER SUPPLY</b>	5Vdc from host equipment
<b>MODULATION TYPE</b>	GFSK
<b>TRANSFER RATE</b>	64kbit/sec
<b>FREQUENCY RANGE</b>	2403 ~ 2480MHz
<b>NUMBER OF CHANNEL</b>	24
<b>ANTENNA TYPE</b>	PCB antenna with 5.06dBi gain
<b>DATA CABLE</b>	1.8m shielded USB cable without core, 0.9m non-shielded power cable without core
<b>I/O PORT</b>	USB
<b>ACCESSORY DEVICES</b>	NA

**NOTE:**

1. Configuration Information:

<b>Configuration #:</b>		<b>Comments: DV phase Receiver unit with EMC fixes for formal report</b>			
<b>Manufacturer</b>	<b>Component type</b>	<b>Part no.</b>	<b>Revision no.</b>	<b>Description</b>	<b>BOM (if known)</b>
Microsoft	2.4G Transceiver			Model: 1353	
Nordic	IC	11300072200		nRF24LU1-F16Q32-R	11300072200
Microsoft	firmware			Jake_Dongle_PID0748_Rev 0206.hex	
KYE	PCB Assy	20000204201	A	PCBA, JAKE, RX, USB, MS, 2.4GHZ, HANDSOLDER	20000204201
Happy, Explus	PCB	10230186200	04	SPCB, JAKE BOARD, 24LU1, U, 4L, 34X23MM	10230186200
Wieson Foxlink	USB Cable	15160151201			15160151201
Foxlink	Magnetic Cable	15400045201			15400045201

**Definition of configuration #:** The configuration number (#) is used for traceability to a particular BOM (Bill of Materials). It is an easy way to readily identify and convey the construction of a without having to include all of the details of a BOM on every test data sheet. If two sets of test data have test samples with the same configuration # then the construction details of those test samples can readily be determined (as long as the configuration # correctly corresponds to a BOM) and that these two test samples have been constructed identically.

**Detailed information on the configuration of the tested samples is required in order to track performance changes across various revisions of the hardware and to document that the samples tested are representative of the final configuration that will be manufactured in production.**

**Any prototype or pre-production components must be clearly identified in the configuration table.**

2. The details of EUT samples listed as below:

SAMPLE	SERIAL NO.
1	Jake-EV2-200
2	Jake-EV2-206
3	Jake-EV2-209

3. The EUT has transmission function when charging.

4. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

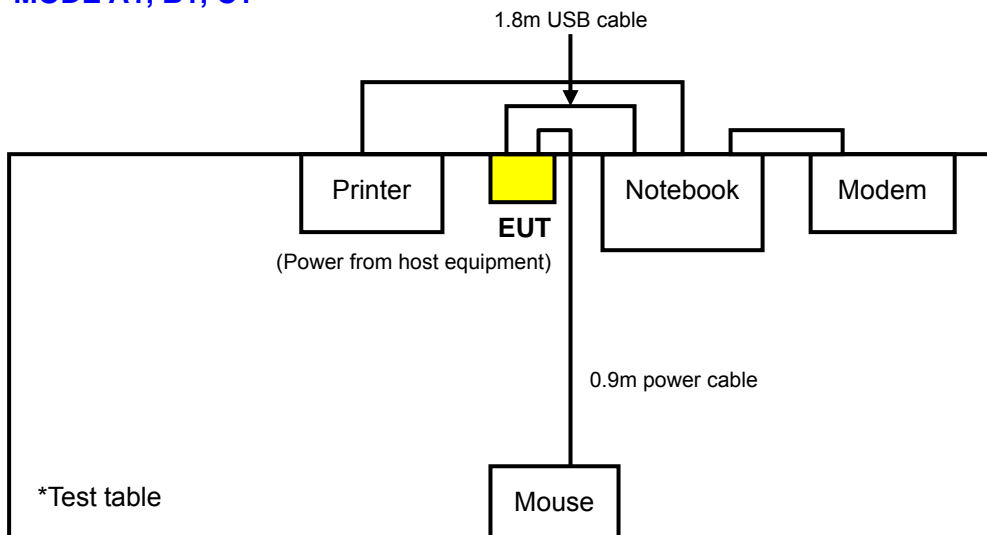
### 3.2 DESCRIPTION OF TEST MODES

24 channels are provided to this EUT.

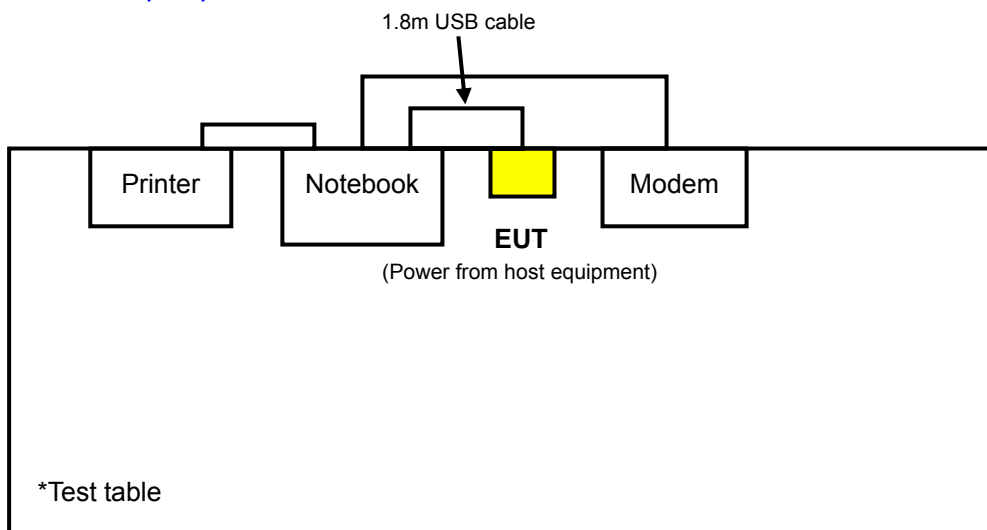
Channel Group	Order they appear by pressing lest button	Frequency (MHz)	Channel Group	Order they appear by pressing lest button	Frequency (MHz)
Subset A	1	2403	Subset D	4	2405
	7	2419		10	2425
	19	2468		16	2444
	13	2478		22	2452
Subset B	2	2429	Subset E	5	2423
	8	2450		11	2446
	14	2470		17	2456
	20	2480		23	2474
Subset C	3	2421	Subset F	6	2417
	9	2431		12	2427
	21	2454		18	2448
	15	2472		24	2476

### 3.2.1 CONFIGURATION OF SYSTEM UNDER TEST

#### TEST MODE A1, B1, C1



#### TEST MODE A2, B2, C2



### 3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION	
	RE≥1G	RE<1G	PLC	BM	SERIAL NO.	TEST CONDITION
A	1	√	√	√	Jake-EV2-200	TX+Charge
	2	-	√	√		TX
B	1	√	√	-	Jake-EV2-206	TX+Charge
	2	-	√	-		TX
C	1	√	√	-	Jake-EV2-209	TX+Charge
	2	-	√	-		TX

Where **PLC**: Power Line Conducted Emission

**RE<1G**: Radiated Emission below 1GHz

**RE≥1G**: Radiated Emission above 1GHz

**BM**: Bandedge Measurement

**NOTE**: "-" means no effect

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

- 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
A1, B1, C1	1 to 24	1, 16, 20	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 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
A1, A2, B1, B2, C1, C2	1 to 24	20	GFSK

#### POWER LINE CONDUCTED EMISSION TEST:

- 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
A1, A2	1 to 24	20	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
A1	1 to 24	1, 20	GFSK

**3.3 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 C63.4-2003**

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.



### 3.4 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 COMPUTER	DELL	PP05L	16484462992	E2K24CLNS
2	PRINTER	EPSON	LQ-300+	DCGY047265	FCC DoC Approved
3	MODEM	ACEEX	1414V/3	0401008269	IFAXDM1414
4	MOUSE	Microsoft®	1352	NA	C3K1352

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	1.8m braid shielded wire, DB25 connector, w/o core.
3	1.2m braid shielded wire, DB25 & DB9 connector, w/o core.
4	NA

**NOTE:**

1. All power cords of the above support units are non shielded (1.8m).
2. Item 4 was for test mode A1, B1 and C1.
3. Item 4 was provided by the client.

## 4. TEST TYPES AND RESULTS

### 4.1 RADIATED EMISSION MEASUREMENT

#### 4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209, 15.249 as following:

15.209 Limit		
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
15.249 Limit		
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

**NOTE:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/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.



#### 4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESI7	100033	Jun. 29, 2009
Spectrum Analyzer Agilent	FSP	100041	Apr. 21, 2009
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	May, 01, 2009
HORN Antenna SCHWARZBECK	9120D	9120D-209	Jun. 23, 2009
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170243	Dec. 24, 2008
Preamplifier Agilent	8447D	2944A10633	Oct. 28, 2008
Preamplifier Agilent	8449B	3008A01964	Oct. 23, 2008
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	283402/4	Dec. 06, 2008
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	251644/4	Dec. 06, 2008
Software ADT.	ADT_Radiated_V7.6	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA
Antenna Tower Controller inn-co GmbH	CO2000	017303	NA
Turn Table ADT.	TT100.	TT93021703	NA
Turn Table Controller ADT.	SC100.	SC93021703	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 3.
  3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
  4. The FCC Site Registration No. is 988962.
  5. The IC Site Registration No. is IC3789B-3.

#### 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.

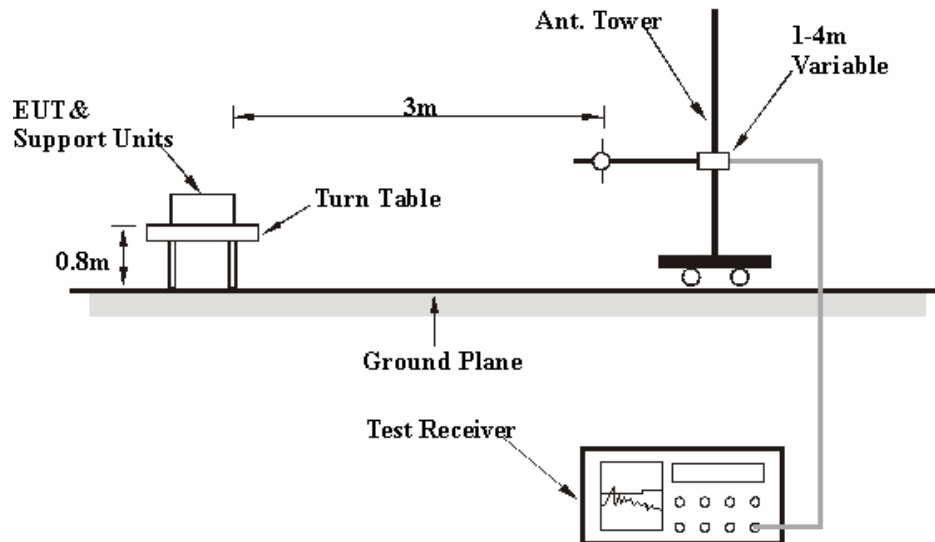
**NOTE:**

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. Duty cycle of EUT is 4.8 % defined by client.  
We get 3.83% duty cycle when EUT in normal operating mode.  
According to formula as below:  
 $AV = PK + 20 \text{ Log duty cycle}$   
4.8% is worse than 3.83 %, so we use 4.8 % to calculate AV value.

#### 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

##### TEST MODE A1, B1, C1

- Connected the EUT to a notebook via USB cable and placed on a testing table.
- The notebook ran a test program (provided by manufacturer) to enable EUT under charging and transmission condition continuously at specific channel frequency.
- Set the EUT under charging condition.
- The necessary accessories enable the system in full functions.

##### TEST MODE A2, B2, C2

- Connected the EUT into notebook and placed on a testing table.
- The notebook ran a test program (provided by manufacturer) to enable EUT under charging and transmission condition continuously at specific channel frequency.
- The necessary accessories enable the system in full functions.



#### 4.1.7 TEST RESULTS

##### RADIATED WORST-CASE DATA: ABOVE 1GHz

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, 64%RH 1002hPa	TEST MODE	A1
TESTED BY	Match Tsui		

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	57.58 PK	74.00	-16.42	1.18 H	330	25.14	32.44
2	2390.00	29.75 AV	54.00	-24.25	1.18 H	330	-2.69	32.44
3	2400.00	54.57 PK	74.00	-19.43	1.18 H	330	22.09	32.48
4	2400.00	28.19 AV	54.00	-25.81	1.18 H	330	-4.29	32.48
5	*2403.00	94.08 PK	114.00	-19.92	1.18 H	330	61.59	32.49
6	*2403.00	67.70 AV	94.00	-26.30	1.18 H	330	35.21	32.49
7	4806.00	54.78 PK	74.00	-19.22	1.25 H	360	16.55	38.22
8	4806.00	28.40 AV	54.00	-25.60	1.25 H	360	-9.82	38.22

- 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:  
 PW = 192 uSec, T= 4 mSec.  
 192 uSec is based on a 32 bytes (max data packet size) which is the max that the Nordic chip can handle. 32 bytes/4 msec = 8Kbytes/sec = 64kbit/sec.  
 The duty cycle is 192usec/4 msec = 4.8 %

$$20\log (\text{Duty cycle}) = 20\log \frac{0.192\text{ms}}{4 \text{ ms}} = -26.38\text{dB}$$

Please see page 33 for plotted duty.



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, 64%RH 1002hPa	TEST MODE	A1
TESTED BY	Match Tsui		

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	57.43 PK	74.00	-16.57	1.12 V	319	24.99	32.44
2	2390.00	29.61 AV	54.00	-24.39	1.12 V	319	-2.83	32.44
3	2400.00	51.20 PK	74.00	-22.80	1.12 V	319	18.72	32.48
4	2400.00	24.82 AV	54.00	-29.18	1.12 V	319	-7.66	32.48
5	*2403.00	91.16 PK	114.00	-22.84	1.12 V	319	58.67	32.49
6	*2403.00	64.78 AV	94.00	-29.22	1.12 V	319	32.29	32.49
7	4806.00	55.24 PK	74.00	-18.76	1.12 V	39	17.01	38.22
8	4806.00	28.86 AV	54.00	-25.14	1.12 V	39	-9.36	38.22

- 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:  
 PW = 192 uSec, T= 4 mSec.  
 192 uSec is based on a 32 bytes (max data packet size) which is the max that the Nordic chip can handle. 32 bytes/4 msec = 8Kbytes/sec = 64kbit/sec.  
 The duty cycle is 192usec/4 msec = 4.8 %

$$20\log (\text{Duty cycle}) = 20\log \frac{0.192\text{ms}}{4 \text{ ms}} = -26.38\text{dB}$$

Please see page 33 for plotted duty.





EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 16	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH 1002hPa	TEST MODE	A1
TESTED BY	Match Tsui		

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	*2444.00	94.36 PK	114.00	-19.64	1.18 H	329	61.73	32.63
2	*2444.00	67.98 AV	94.00	-26.02	1.18 H	329	35.35	32.63
3	4888.00	52.00 PK	74.00	-22.00	1.20 H	12	13.45	38.55
4	4888.00	25.62 AV	54.00	-28.38	1.20 H	12	-12.93	38.55

- 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:  
PW = 192 uSec, T= 4 mSec.

192 uSec is based on a 32 bytes (max data packet size) which is the max that the Nordic chip can handle. 32 bytes/4 msec = 8Kbytes/sec = 64kbit/sec.  
The duty cycle is 192usec/4 msec = 4.8 %

$$20\log (\text{Duty cycle}) = 20\log \frac{0.192\text{ms}}{4 \text{ ms}} = -26.38\text{dB}$$

Please see page 33 for plotted duty.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 16	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH 1002hPa	TEST MODE	A1
TESTED BY	Match Tsui		

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	*2444.00	91.22 PK	114.00	-22.78	1.12 V	31	58.59	32.63
2	*2444.00	64.84 AV	94.00	-29.16	1.12 V	31	32.21	32.63
3	4888.00	51.15 PK	74.00	-22.85	1.00 V	115	12.60	38.55
4	4888.00	24.77 AV	54.00	-29.23	1.00 V	115	-13.78	38.55

- 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:  
PW = 192 uSec, T= 4 mSec.

192 uSec is based on a 32 bytes (max data packet size) which is the max that the Nordic chip can handle. 32 bytes/4 msec = 8Kbytes/sec = 64kbit/sec.  
The duty cycle is 192usec/4 msec = 4.8 %

$$20\log (\text{Duty cycle}) = 20\log \frac{0.192\text{ms}}{4 \text{ ms}} = -26.38\text{dB}$$

Please see page 33 for plotted duty.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 20	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH 1002hPa	TEST MDOE	A1
TESTED BY	Match Tsui		

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	*2480.00	94.89 PK	114.00	-19.11	1.03 H	31	62.15	32.74
2	*2480.00	68.51 AV	94.00	-25.49	1.03 H	31	35.77	32.74
3	2483.50	44.36 PK	74.00	-29.64	1.03 H	31	11.60	32.76
4	2483.50	17.98 AV	54.00	-36.02	1.03 H	31	-14.78	32.76
5	4960.00	49.23 PK	74.00	-24.77	1.18 H	360	10.52	38.71
6	4960.00	22.85 AV	54.00	-31.15	1.18 H	360	-15.86	38.71

- 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:  
PW = 192 uSec, T= 4 mSec.

192 uSec is based on a 32 bytes (max data packet size) which is the max that the Nordic chip can handle. 32 bytes/4 msec = 8Kbytes/sec = 64kbit/sec.  
The duty cycle is 192uSec/4 msec = 4.8 %

$$20\log (\text{Duty cycle}) = 20\log \frac{0.192\text{ms}}{4 \text{ ms}} = -26.38\text{dB}$$

Please see page 33 for plotted duty.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 20	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH 1002hPa	TEST MDOE	A1
TESTED BY	Match Tsui		

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	*2480.00	92.71 PK	114.00	-21.29	1.32 V	231	59.97	32.74
2	*2480.00	66.33 AV	94.00	-27.67	1.32 V	231	33.59	32.74
3	2483.50	42.18 PK	74.00	-31.82	1.32 V	231	9.42	32.76
4	2483.50	15.80 AV	54.00	-38.20	1.32 V	231	-16.96	32.76
5	4960.00	49.58 PK	74.00	-24.42	1.12 V	7	10.87	38.71
6	4960.00	23.20 AV	54.00	-30.80	1.12 V	7	-15.51	38.71

- 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:  
PW = 192 uSec, T= 4 mSec.  
192 uSec is based on a 32 bytes (max data packet size) which is the max that the Nordic chip can handle. 32 bytes/4 msec = 8Kbytes/sec = 64kbit/sec.  
The duty cycle is 192usec/4 msec = 4.8 %

$$20\log (\text{Duty cycle}) = 20\log \frac{0.192\text{ms}}{4 \text{ ms}} = -26.38\text{dB}$$

Please see page 33 for plotted duty.



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, 64%RH 1002hPa	TEST MODE	B1
TESTED BY	Match Tsui		

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	57.61 PK	74.00	-16.39	1.34 H	353	25.17	32.44
2	2390.00	29.79 AV	54.00	-24.21	1.34 H	353	-2.65	32.44
3	2400.00	52.54 PK	74.00	-21.46	1.34 H	353	20.06	32.48
4	2400.00	26.16 AV	54.00	-27.84	1.34 H	353	-6.32	32.48
5	*2403.00	94.01 PK	114.00	-19.99	1.34 H	353	61.52	32.49
6	*2403.00	67.63 AV	94.00	-26.37	1.34 H	353	35.14	32.49
7	4806.00	51.17 PK	74.00	-22.83	1.62 H	99	12.94	38.22
8	4806.00	24.79 AV	54.00	-29.21	1.62 H	99	-13.43	38.22

- 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:  
 PW = 192 uSec, T= 4 mSec.  
 192 uSec is based on a 32 bytes (max data packet size) which is the max that the Nordic chip can handle. 32 bytes/4 msec = 8Kbytes/sec = 64kbit/sec.  
 The duty cycle is 192usec/4 msec = 4.8 %

$$20\log (\text{Duty cycle}) = 20\log \frac{0.192\text{ms}}{4 \text{ ms}} = -26.38\text{dB}$$

Please see page 33 for plotted duty.

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, 64%RH 1002hPa	TEST MODE	B1
TESTED BY	Match Tsui		

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	57.16 PK	74.00	-16.84	1.33 V	360	24.72	32.44
2	2390.00	29.24 AV	54.00	-24.76	1.33 V	360	-3.20	32.44
3	2400.00	47.34 PK	74.00	-26.66	1.33 V	360	14.86	32.48
4	2400.00	20.96 AV	54.00	-33.04	1.33 V	360	-11.52	32.48
5	*2403.00	89.15 PK	114.00	-24.85	1.33 V	360	56.66	32.49
6	*2403.00	62.77 AV	94.00	-31.23	1.33 V	360	30.28	32.49
7	4806.00	52.44 PK	74.00	-21.56	1.00 V	133	14.21	38.22
8	4806.00	26.06 AV	54.00	-27.94	1.00 V	133	-12.16	38.22

- 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:  
PW = 192 uSec, T= 4 mSec.

192 uSec is based on a 32 bytes (max data packet size) which is the max that the Nordic chip can handle. 32 bytes/4 msec = 8Kbytes/sec = 64kbit/sec.  
The duty cycle is 192usec/4 msec = 4.8 %

$$20\log (\text{Duty cycle}) = 20\log \frac{0.192\text{ms}}{4 \text{ ms}} = -26.38\text{dB}$$

Please see page 33 for plotted duty.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 16	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH 1002hPa	TEST MODE	B1
TESTED BY	Match Tsui		

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	*2444.00	94.36 PK	114.00	-22.29	1.09 H	195	61.73	32.63
2	*2444.00	67.98 AV	94.00	-26.02	1.09 H	195	35.35	32.63
3	4888.00	49.15 PK	74.00	-24.85	1.00 H	344	10.60	38.55
4	4888.00	22.77 AV	54.00	-31.23	1.00 H	344	-15.78	38.55

- 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:  
 PW = 192 uSec, T= 4 mSec.  
 192 uSec is based on a 32 bytes (max data packet size) which is the max that the Nordic chip can handle. 32 bytes/4 msec = 8Kbytes/sec = 64kbit/sec.  
 The duty cycle is 192usec/4 msec = 4.8 %

$$20\log (\text{Duty cycle}) = 20\log \frac{0.192\text{ms}}{4 \text{ ms}} = -26.38\text{dB}$$

Please see page 33 for plotted duty.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 16	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH 1002hPa	TEST MODE	B1
TESTED BY	Match Tsui		

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	*2444.00	91.71 PK	114.00	-22.29	1.12 V	262	59.08	32.63
2	*2444.00	65.33 AV	94.00	-28.67	1.12 V	262	32.70	32.63
3	4888.00	50.27 PK	74.00	-23.73	1.11 V	128	11.72	38.55
4	4888.00	23.89 AV	54.00	-30.11	1.11 V	128	-14.66	38.55

- 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:  
 PW = 192 uSec, T= 4 mSec.  
 192 uSec is based on a 32 bytes (max data packet size) which is the max that the Nordic chip can handle. 32 bytes/4 msec = 8Kbytes/sec = 64kbit/sec.  
 The duty cycle is 192usec/4 msec = 4.8 %

$$20\log (\text{Duty cycle}) = 20\log \frac{0.192\text{ms}}{4 \text{ ms}} = -26.38\text{dB}$$

Please see page 33 for plotted duty.





EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 20	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH 1002hPa	TEST MODE	B1
TESTED BY	Match Tsui		

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	*2480.00	94.03 PK	114.00	-19.97	1.26 H	350	61.29	32.74
2	*2480.00	67.65 AV	94.00	-26.35	1.26 H	350	34.91	32.74
3	2483.50	43.57 PK	74.00	-30.43	1.26 H	350	10.81	32.76
4	2483.50	17.19 AV	54.00	-36.81	1.26 H	350	-15.57	32.76
5	4960.00	49.41 PK	74.00	-24.59	1.28 H	102	10.70	38.71
6	4960.00	23.03 AV	54.00	-30.97	1.28 H	102	-15.68	38.71

- 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:  
 PW = 192 uSec, T= 4 mSec.  
 192 uSec is based on a 32 bytes (max data packet size) which is the max that the Nordic chip can handle. 32 bytes/4 msec = 8Kbytes/sec = 64kbit/sec.  
 The duty cycle is 192usec/4 msec = 4.8 %

$$20\log (\text{Duty cycle}) = 20\log \frac{0.192\text{ms}}{4 \text{ ms}} = -26.38\text{dB}$$

Please see page 33 for plotted duty.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 20	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH 1002hPa	TEST MODE	B1
TESTED BY	Match Tsui		

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	*2480.00	92.16 PK	114.00	-21.84	1.07 V	263	59.42	32.74
2	*2480.00	65.78 AV	94.00	-28.22	1.07 V	263	33.04	32.74
3	2483.50	42.35 PK	74.00	-31.65	1.07 V	263	9.59	32.76
4	2483.50	15.97 AV	54.00	-38.03	1.07 V	263	-16.79	32.76
5	4960.00	50.56 PK	74.00	-23.44	1.22 V	115	11.85	38.71
6	4960.00	24.18 AV	54.00	-29.82	1.22 V	115	-14.53	38.71

- 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:  
 PW = 192 uSec, T= 4 mSec.  
 192 uSec is based on a 32 bytes (max data packet size) which is the max that the Nordic chip can handle. 32 bytes/4 msec = 8Kbytes/sec = 64kbit/sec.  
 The duty cycle is 192usec/4 msec = 4.8 %

$$20\log (\text{Duty cycle}) = 20\log \frac{0.192\text{ms}}{4 \text{ ms}} = -26.38\text{dB}$$

Please see page 33 for plotted duty.

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, 64%RH 1002hPa	TEST MODE	C1
TESTED BY	Match Tsui		

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	58.81 PK	74.00	-15.19	1.37 H	9	26.37	32.44
2	2390.00	29.64 AV	54.00	-24.36	1.37 H	9	-2.80	32.44
3	2400.00	52.40 PK	74.00	-21.60	1.37 H	9	19.92	32.48
4	2400.00	26.02 AV	54.00	-27.98	1.37 H	9	-6.46	32.48
5	*2403.00	93.86 PK	114.00	-20.14	1.37 H	9	61.37	32.49
6	*2403.00	67.48 AV	94.00	-26.52	1.37 H	9	34.99	32.49
7	4806.00	52.24 PK	74.00	-21.76	1.01 H	128	14.01	38.22
8	4806.00	25.86 AV	54.00	-28.14	1.01 H	128	-12.36	38.22

- 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:  
PW = 192 uSec, T= 4 mSec.  
192 uSec is based on a 32 bytes (max data packet size) which is the max that the Nordic chip can handle. 32 bytes/4 msec = 8Kbytes/sec = 64kbit/sec.  
The duty cycle is 192usec/4 msec = 4.8 %

$$20\log (\text{Duty cycle}) = 20\log \frac{0.192\text{ms}}{4 \text{ ms}} = -26.38\text{dB}$$

Please see page 33 for plotted duty.



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, 64%RH 1002hPa	TEST MODE	C1
TESTED BY	Match Tsui		

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	57.16 PK	74.00	-16.84	1.00 V	38	24.72	32.44
2	2390.00	29.30 AV	54.00	-24.70	1.00 V	38	-3.14	32.44
3	2400.00	48.08 PK	74.00	-25.92	1.00 V	38	15.60	32.48
4	2400.00	21.70 AV	54.00	-32.30	1.00 V	38	-10.78	32.48
5	*2403.00	89.92 PK	114.00	-24.08	1.00 V	38	57.43	32.49
6	*2403.00	63.54 AV	94.00	-30.46	1.00 V	38	31.05	32.49
7	4806.00	53.26 PK	74.00	-20.74	1.01 V	128	15.03	38.22
8	4806.00	26.88 AV	54.00	-27.12	1.01 V	128	-11.34	38.22

- 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:  
 PW = 192 uSec, T= 4 mSec.  
 192 uSec is based on a 32 bytes (max data packet size) which is the max that the Nordic chip can handle. 32 bytes/4 msec = 8Kbytes/sec = 64kbit/sec.  
 The duty cycle is 192usec/4 msec = 4.8 %

$$20\log (\text{Duty cycle}) = 20\log \frac{0.192\text{ms}}{4 \text{ ms}} = -26.38\text{dB}$$

Please see page 33 for plotted duty.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 16	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH 1002hPa	TEST MODE	C1
TESTED BY	Match Tsui		

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	*2444.00	93.69 PK	114.00	-20.31	1.30 H	360	61.06	32.63
2	*2444.00	67.31 AV	94.00	-26.69	1.30 H	360	34.68	32.63
3	4888.00	52.09 PK	74.00	-21.91	1.10 H	351	13.54	38.55
4	4888.00	25.71 AV	54.00	-28.29	1.10 H	351	-12.84	38.55

- 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:  
 PW = 192 uSec, T= 4 mSec.  
 192 uSec is based on a 32 bytes (max data packet size) which is the max that the Nordic chip can handle. 32 bytes/4 msec = 8Kbytes/sec = 64kbit/sec.  
 The duty cycle is 192usec/4 msec = 4.8 %

$$20\log (\text{Duty cycle}) = 20\log \frac{0.192\text{ms}}{4 \text{ ms}} = -26.38\text{dB}$$

Please see page 33 for plotted duty.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 16	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH 1002hPa	TEST MODE	C1
TESTED BY	Match Tsui		

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	*2444.00	90.92 PK	114.00	-23.08	1.13 V	280	58.29	32.63
2	*2444.00	64.54 AV	94.00	-29.46	1.13 V	280	31.91	32.63
3	4888.00	52.40 PK	74.00	-21.60	1.10 V	33	13.85	38.55
4	4888.00	26.02 AV	54.00	-27.98	1.10 V	33	-12.53	38.55

- 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:  
 PW = 192 uSec, T= 4 mSec.  
 192 uSec is based on a 32 bytes (max data packet size) which is the max that the Nordic chip can handle. 32 bytes/4 msec = 8Kbytes/sec = 64kbit/sec.  
 The duty cycle is 192usec/4 msec = 4.8 %

$$20\log (\text{Duty cycle}) = 20\log \frac{0.192\text{ms}}{4 \text{ ms}} = -26.38\text{dB}$$

Please see page 33 for plotted duty.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 20	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH 1002hPa	TEST MODE	C1
TESTED BY	Match Tsui		

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	*2480.00	94.16 PK	114.00	-19.84	1.05 H	360	61.42	32.74
2	*2480.00	67.78 AV	94.00	-26.22	1.05 H	360	35.04	32.74
3	2483.50	48.62 PK	74.00	-25.38	1.05 H	360	15.86	32.76
4	2483.50	22.24 AV	54.00	-31.76	1.05 H	360	-10.52	32.76
5	4960.00	49.24 PK	74.00	-24.76	1.00 H	65	10.53	38.71
6	4960.00	22.86 AV	54.00	-31.14	1.00 H	65	-15.85	38.71

- 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:  
PW = 192 uSec, T= 4 mSec.  
192 uSec is based on a 32 bytes (max data packet size) which is the max that the Nordic chip can handle. 32 bytes/4 msec = 8Kbytes/sec = 64kbit/sec.  
The duty cycle is 192usec/4 msec = 4.8 %

$$20\log (\text{Duty cycle}) = 20\log \frac{0.192\text{ms}}{4 \text{ ms}} = -26.38\text{dB}$$

Please see page 33 for plotted duty.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 20	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH 1002hPa	TEST MODE	C1
TESTED BY	Match Tsui		

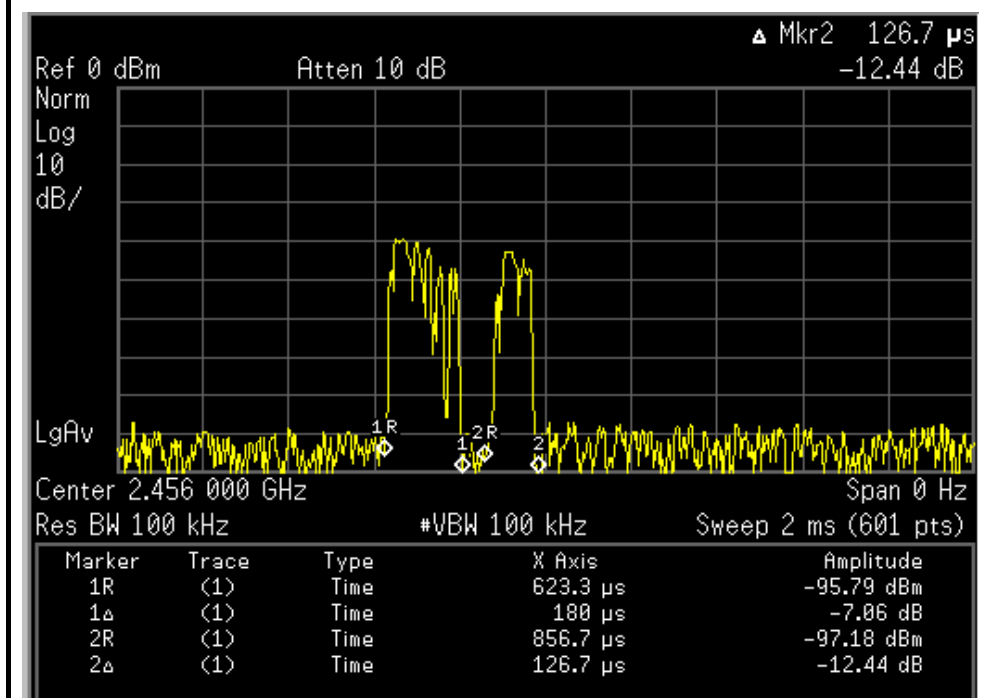
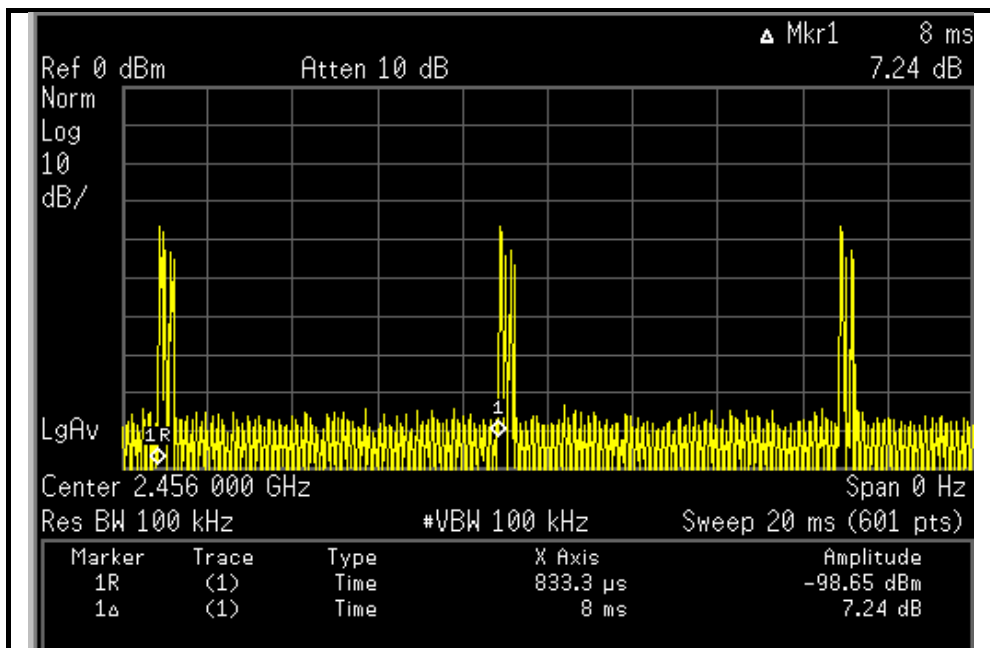
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	91.48 PK	114.00	-22.52	1.42 V	302	58.74	32.74
2	*2480.00	65.10 AV	94.00	-28.90	1.42 V	302	32.36	32.74
3	2483.50	46.45 PK	74.00	-27.55	1.42 V	302	13.69	32.76
4	2483.50	20.07 AV	54.00	-33.93	1.42 V	302	-12.69	32.76
5	4960.00	49.57 PK	74.00	-24.43	1.20 V	310	10.86	38.71
6	4960.00	23.19 AV	54.00	-30.81	1.20 V	310	-15.52	38.71

- 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:  
 PW = 192 uSec, T= 4 mSec.  
 192 uSec is based on a 32 bytes (max data packet size) which is the max that the Nordic chip can handle. 32 bytes/4 msec = 8Kbytes/sec = 64kbit/sec.  
 The duty cycle is 192usec/4 msec = 4.8 %

$$20\log (\text{Duty cycle}) = 20\log \frac{0.192\text{ms}}{4 \text{ ms}} = -26.38\text{dB}$$

Please see page 33 for plotted duty.





$$\text{Duty cycle} = \frac{180 + 126.7 \mu\text{s}}{8 \text{ ms}} \times 100\% = 3.83\%$$

**BELOW 1GHz WORST-CASE DATA :**

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 20	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH 1002hPa	TEST MODE	A1
TESTED BY	Match Tsui		

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	76.56	26.96 QP	40.00	-13.04	2.00 H	34	16.76	10.20
2	117.39	31.05 QP	43.50	-12.45	1.50 H	310	19.24	11.81
3	169.89	27.98 QP	43.50	-15.52	1.50 H	238	13.74	14.24
4	249.60	29.12 QP	46.00	-16.88	1.00 H	55	14.72	14.40
5	527.64	29.26 QP	46.00	-16.74	1.50 H	232	7.17	22.08
6	935.94	30.69 QP	46.00	-15.31	1.50 H	292	0.40	30.29
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	47.40	32.43 QP	40.00	-7.57	1.25 V	19	18.44	13.99
2	113.50	28.61 QP	43.50	-14.89	1.00 V	310	16.77	11.84
3	132.95	28.67 QP	43.50	-14.83	1.25 V	289	15.83	12.84
4	177.67	27.04 QP	43.50	-16.46	1.00 V	109	14.08	12.97
5	731.79	29.01 QP	46.00	-16.99	1.50 V	253	2.16	26.84
6	864.00	31.11 QP	46.00	-14.89	1.00 V	256	2.05	29.06

- 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.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 20	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH 1002hPa	TEST MODE	A2
TESTED BY	Match Tsui		

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	35.73	28.74 QP	40.00	-11.26	1.50 H	49	14.20	14.54
2	99.89	30.41 QP	43.50	-13.09	2.00 H	229	18.47	11.94
3	160.17	29.08 QP	43.50	-14.42	1.50 H	103	14.25	14.83
4	171.83	30.57 QP	43.50	-12.93	1.50 H	259	16.44	14.13
5	735.68	29.46 QP	46.00	-16.54	1.00 H	94	2.57	26.89
6	864.00	30.47 QP	46.00	-15.53	1.00 H	49	1.42	29.06
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	43.51	33.89 QP	40.00	-6.11	1.50 V	46	19.14	14.75
2	84.34	27.40 QP	40.00	-12.60	2.00 V	187	19.05	8.35
3	107.67	33.84 QP	43.50	-9.66	1.25 V	145	21.94	11.90
4	731.79	30.71 QP	46.00	-15.29	1.00 V	10	3.87	26.84
5	867.89	31.12 QP	46.00	-14.88	1.25 V	31	1.97	29.15
6	935.94	32.07 QP	46.00	-13.93	1.25 V	214	1.77	30.29
7	943.72	30.92 QP	46.00	-15.08	2.00 V	334	0.54	30.38

- 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.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 20	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH 1002hPa	TEST MODE	B1
TESTED BY	Kevin Liang		

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	111.56	20.81 QP	43.50	-22.69	1.50 H	271	8.94	11.86
2	166.00	28.92 QP	43.50	-14.58	1.50 H	253	14.44	14.48
3	576.25	30.85 QP	46.00	-15.15	1.50 H	196	7.70	23.15
4	834.84	30.52 QP	46.00	-15.48	1.00 H	208	2.14	28.37
5	864.00	30.06 QP	46.00	-15.94	1.50 H	241	1.00	29.06
6	933.99	30.28 QP	46.00	-15.72	1.50 H	262	0.01	30.27
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	39.62	32.97 QP	40.00	-7.03	1.50 V	274	17.68	15.30
2	66.84	26.11 QP	40.00	-13.89	1.00 V	199	12.61	13.50
3	531.53	29.62 QP	46.00	-16.38	1.00 V	247	7.45	22.17
4	865.94	30.49 QP	46.00	-15.51	1.50 V	304	1.38	29.10
5	932.05	31.54 QP	46.00	-14.46	1.00 V	292	1.29	30.25

- 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.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 20	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH 1002hPa	TEST MODE	B2
TESTED BY	Match Tsui		

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	160.17	30.40 QP	43.50	-13.10	2.00 H	262	15.57	14.83
2	171.83	28.22 QP	43.50	-15.28	1.50 H	286	14.09	14.13
3	576.25	35.16 QP	46.00	-10.84	1.50 H	229	12.01	23.15
4	731.79	31.53 QP	46.00	-14.47	1.00 H	85	4.68	26.84
5	867.89	30.23 QP	46.00	-15.77	1.50 H	49	1.08	29.15
6	902.89	30.23 QP	46.00	-15.77	1.50 H	31	0.30	29.93
7	935.94	31.17 QP	46.00	-14.83	1.50 H	55	0.87	30.29
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	35.73	33.54 QP	40.00	-6.46	1.50 V	133	19.00	14.54
2	66.84	26.35 QP	40.00	-13.65	1.00 V	46	12.85	13.50
3	115.45	32.62 QP	43.50	-10.88	1.25 V	28	20.80	11.83
4	171.83	27.88 QP	43.50	-15.62	1.00 V	64	13.76	14.13
5	576.25	32.71 QP	46.00	-13.29	1.00 V	346	9.57	23.15
6	733.73	30.03 QP	46.00	-15.97	1.50 V	163	3.16	26.87
7	768.73	30.18 QP	46.00	-15.82	1.25 V	142	2.95	27.23
8	864.00	32.41 QP	46.00	-13.59	1.50 V	16	3.36	29.06
9	883.44	30.26 QP	46.00	-15.74	1.50 V	7	0.74	29.51
10	932.05	31.97 QP	46.00	-14.03	1.25 V	235	1.72	30.25

- 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.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 20	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH 1002hPa	TEST MODE	C1
TESTED BY	Kevin Liang		

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	109.62	25.92 QP	43.50	-17.58	1.50 H	262	14.04	11.88
2	167.94	31.48 QP	43.50	-12.02	1.50 H	235	17.12	14.36
3	222.38	25.03 QP	46.00	-20.97	1.00 H	256	12.47	12.55
4	399.31	31.35 QP	46.00	-14.65	1.00 H	274	12.44	18.91
5	677.35	31.68 QP	46.00	-14.32	1.00 H	244	5.83	25.85
6	864.00	30.03 QP	46.00	-15.97	1.50 H	259	0.97	29.06
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	39.62	32.48 QP	40.00	-7.52	1.00 V	277	17.18	15.30
2	109.62	29.42 QP	43.50	-14.08	1.25 V	232	17.53	11.88
3	167.94	26.18 QP	43.50	-17.32	1.50 V	187	11.82	14.36
4	661.79	31.48 QP	46.00	-14.52	1.00 V	100	6.07	25.41
5	865.94	31.54 QP	46.00	-14.46	1.50 V	325	2.44	29.10
6	935.94	31.95 QP	46.00	-14.05	1.25 V	220	1.66	30.29

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



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 20	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH 1002hPa	TEST MODE	C2
TESTED BY	Match Tsui		

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	45.45	25.89 QP	40.00	-14.11	1.50 H	52	11.50	14.39
2	160.17	28.40 QP	43.50	-15.10	1.50 H	85	13.57	14.83
3	171.83	29.72 QP	43.50	-13.78	1.50 H	325	15.59	14.13
4	576.25	33.28 QP	46.00	-12.72	1.50 H	193	10.13	23.15
5	864.00	30.89 QP	46.00	-15.11	1.25 H	136	1.83	29.06
6	930.11	30.92 QP	46.00	-15.08	1.00 H	178	0.69	30.23
7	951.49	30.57 QP	46.00	-15.43	2.00 H	304	0.11	30.46
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	45.45	33.12 QP	40.00	-6.88	1.00 V	139	18.73	14.39
2	113.50	30.57 QP	43.50	-12.93	1.25 V	67	18.73	11.84
3	166.00	28.19 QP	43.50	-15.31	1.00 V	85	13.71	14.48
4	576.25	31.74 QP	46.00	-14.26	1.00 V	10	8.59	23.15
5	864.00	31.55 QP	46.00	-14.45	1.50 V	10	2.49	29.06
6	932.05	31.59 QP	46.00	-14.41	1.25 V	208	1.34	30.25

- 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 0.50 MHz.
  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.	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESCS30	100288	Sep. 21, 2008
RF signal cable Woken	5D-FB	Cable-HYCO3-01	Jan. 06, 2009
LISN ROHDE & SCHWARZ	ESH2-Z5	100100	Jan. 09, 2009
LISN SCHWARZBECK	ESH3-Z5	100311	Jan. 21, 2009
Software ADT	ADT_Cond_V3	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.



#### 4.2.3 TEST PROCEDURES

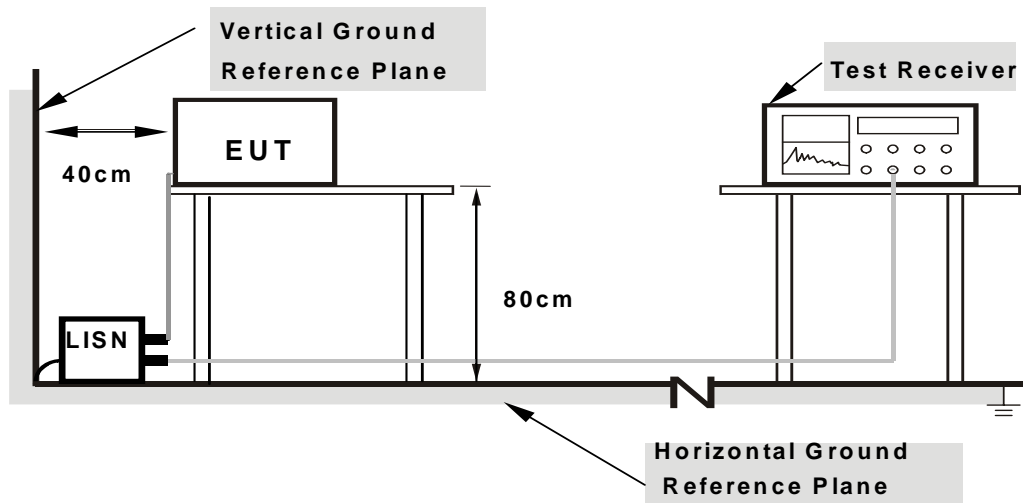
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling 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.

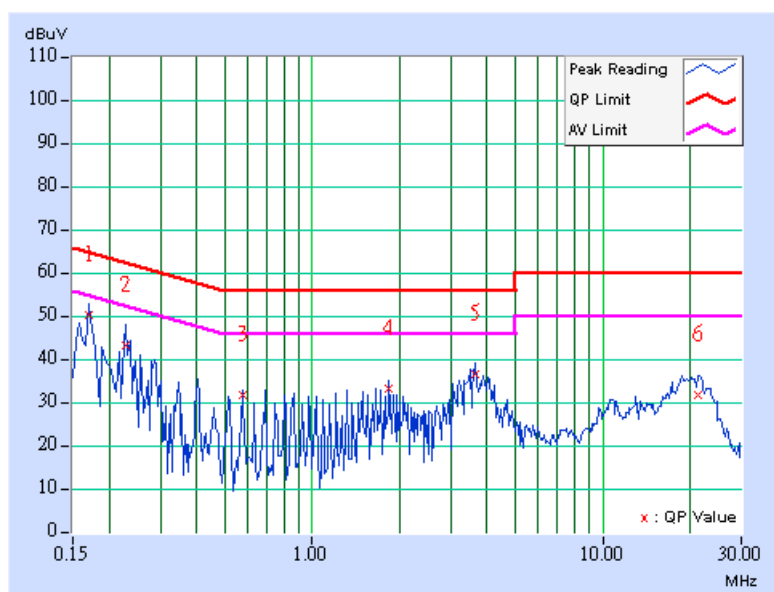
## 4.2.7 TEST RESULTS

### CONDUCTED WORST-CASE DATA :

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 20	PHASE	Line 1
MODULATION TYPE	GFSK	6dB BANDWIDTH	9 kHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	25deg. C, 61%RH, 1002hPa
TEST MODE	A1	TESTED BY	Kevin Liang

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.171	0.13	48.92	-	49.05	-	64.92
2	0.228	0.13	41.98	-	42.11	-	62.52	52.52	-20.41	-
3	0.576	0.15	30.53	-	30.68	-	56.00	46.00	-25.32	-
4	1.836	0.25	31.97	-	32.22	-	56.00	46.00	-23.78	-
5	3.617	0.41	35.37	-	35.78	-	56.00	46.00	-20.22	-
6	21.297	1.38	30.55	-	31.93	-	60.00	50.00	-28.07	-

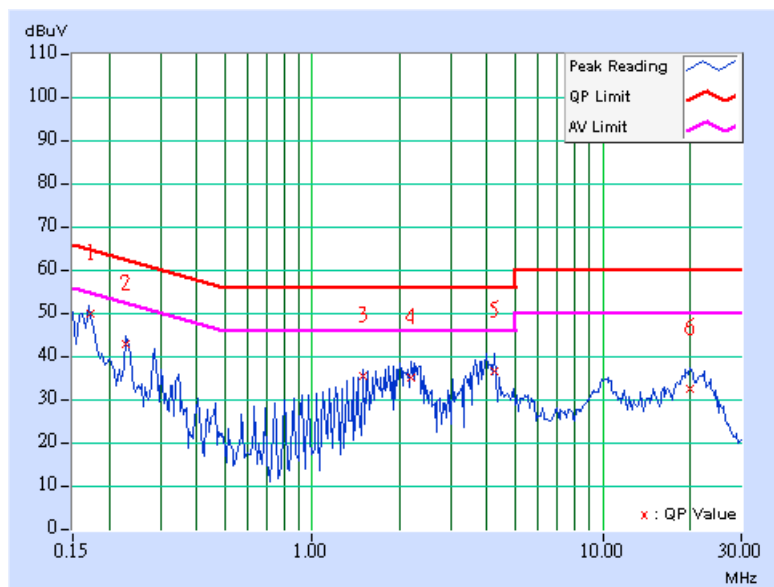
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 20	PHASE	Line 2
MODULATION TYPE	GFSK	6dB BANDWIDTH	9 kHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	25deg. C, 61%RH, 1002hPa
TEST MODE	A1	TESTED BY	Kevin Liang

No	Freq. [MHz]	Corr. Factor [dB]	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.172	0.14	49.15	-	49.29	-	64.86
2	0.228	0.14	42.18	-	42.32	-	62.52	52.52	-20.20	-
3	1.492	0.22	34.51	-	34.73	-	56.00	46.00	-21.27	-
4	2.184	0.28	34.32	-	34.60	-	56.00	46.00	-21.40	-
5	4.250	0.44	35.58	-	36.02	-	56.00	46.00	-19.98	-
6	19.926	0.96	31.53	-	32.49	-	60.00	50.00	-27.51	-

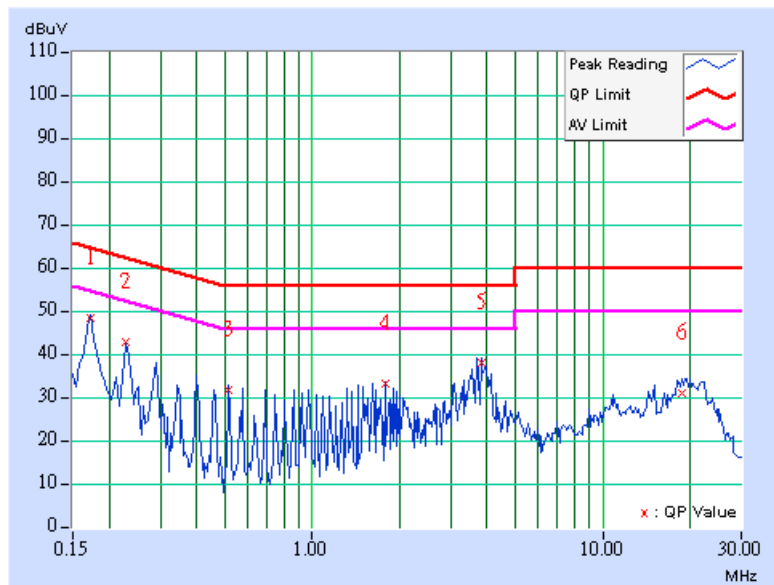
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 20	PHASE	Line 1
MODULATION TYPE	GFSK	6dB BANDWIDTH	9 kHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	25deg. C, 61%RH, 1002hPa
TEST MODE	A2	TESTED BY	Kevin Liang

No	Freq. [MHz]	Corr. Factor [dB]	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.173	0.13	47.46	-	47.59	-	64.79	54.79	-17.21	-
2	0.228	0.13	41.67	-	41.80	-	62.52	52.52	-20.72	-
3	0.517	0.15	30.70	-	30.85	-	56.00	46.00	-25.15	-
4	1.781	0.24	31.95	-	32.19	-	56.00	46.00	-23.81	-
5	3.848	0.43	36.82	-	37.25	-	56.00	46.00	-18.75	-
6	18.837	1.21	29.78	-	30.99	-	60.00	50.00	-29.01	-

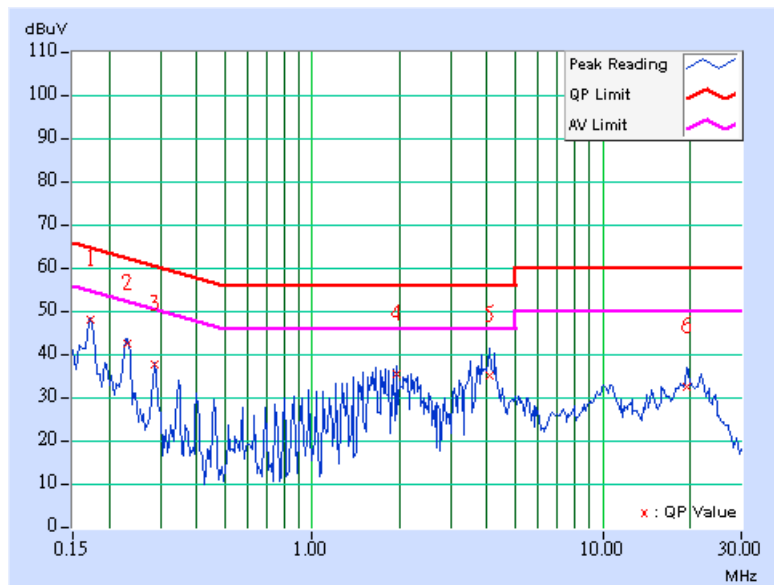
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 20	PHASE	Line 2
MODULATION TYPE	GFSK	6dB BANDWIDTH	9 kHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	25deg. C, 61%RH, 1002hPa
TEST MODE	A2	TESTED BY	Kevin Liang

No	Freq. [MHz]	Corr. Factor [dB]	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.173	0.14	47.12	-	47.26	-	64.79	54.79	-17.53	-
2	0.232	0.14	41.67	-	41.81	-	62.38	52.38	-20.57	-
3	0.287	0.14	36.78	-	36.92	-	60.62	50.62	-23.69	-
4	1.949	0.26	34.61	-	34.87	-	56.00	46.00	-21.13	-
5	4.078	0.43	34.24	-	34.67	-	56.00	46.00	-21.33	-
6	19.578	0.94	31.64	-	32.58	-	60.00	50.00	-27.42	-

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.





### 4.3 BAND EDGES MEASUREMENT

#### 4.3.1 LIMITS OF BAND EDGES MEASUREMENT

Below –50dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

#### 4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
SPECTRUM ANALYZER	FSP40	100041	Apr. 21, 2009

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

#### 4.3.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100 kHz and 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

The spectrum plots are attached on the following pages.

#### 4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

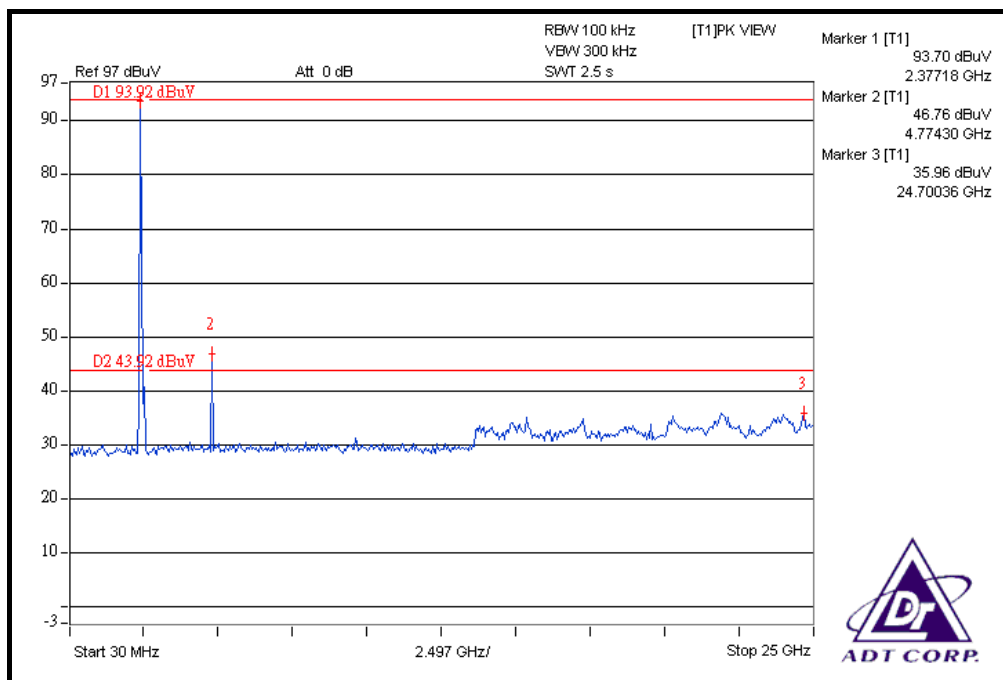
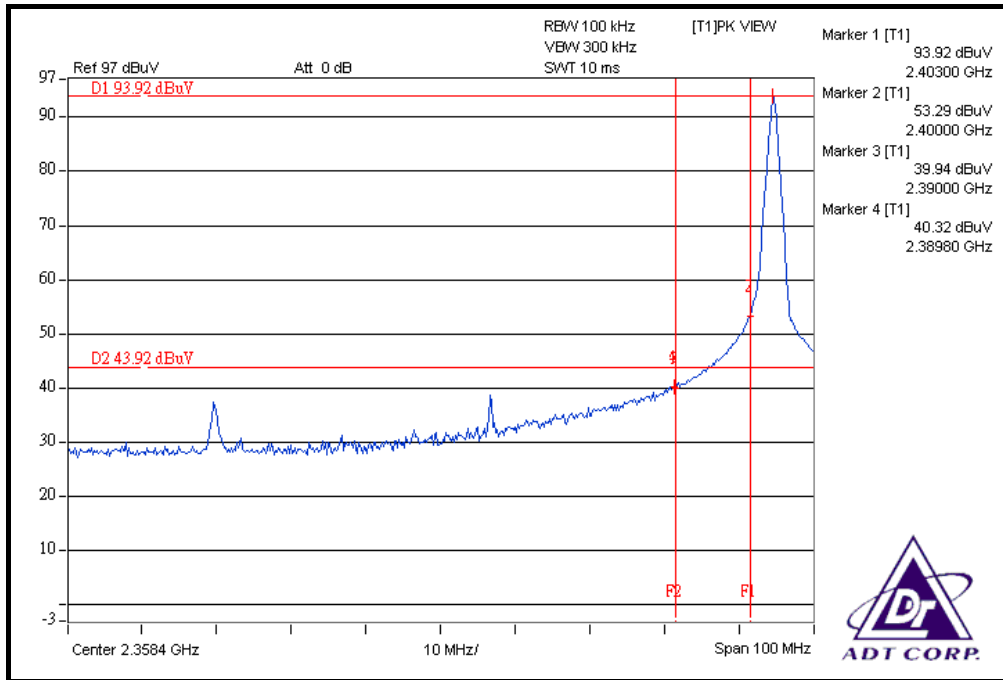
#### 4.3.5 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at lowest and highest channel frequencies individually.

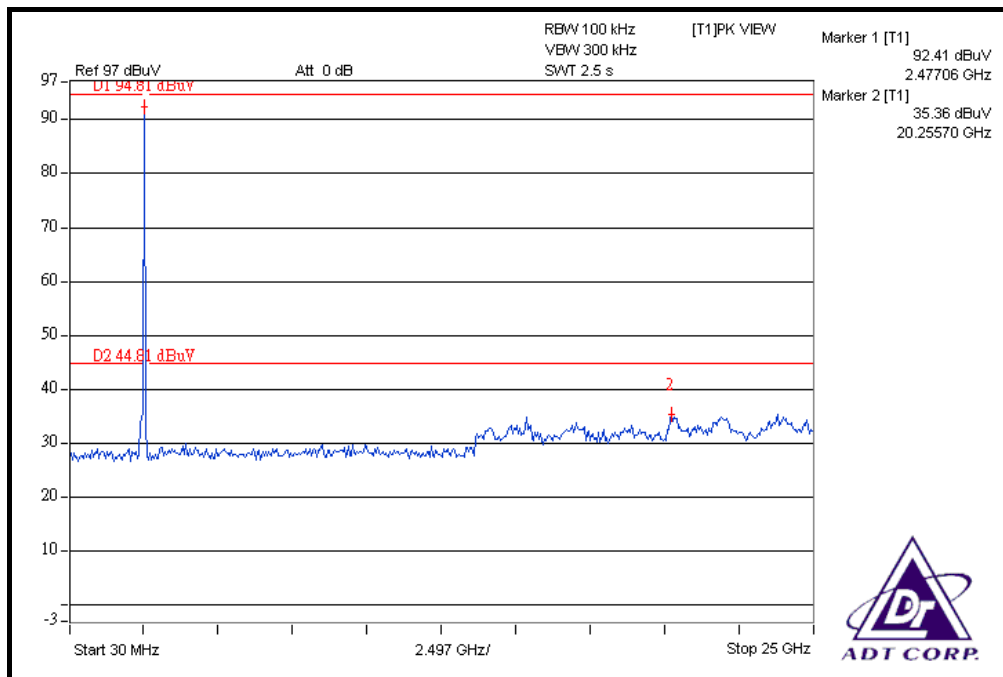
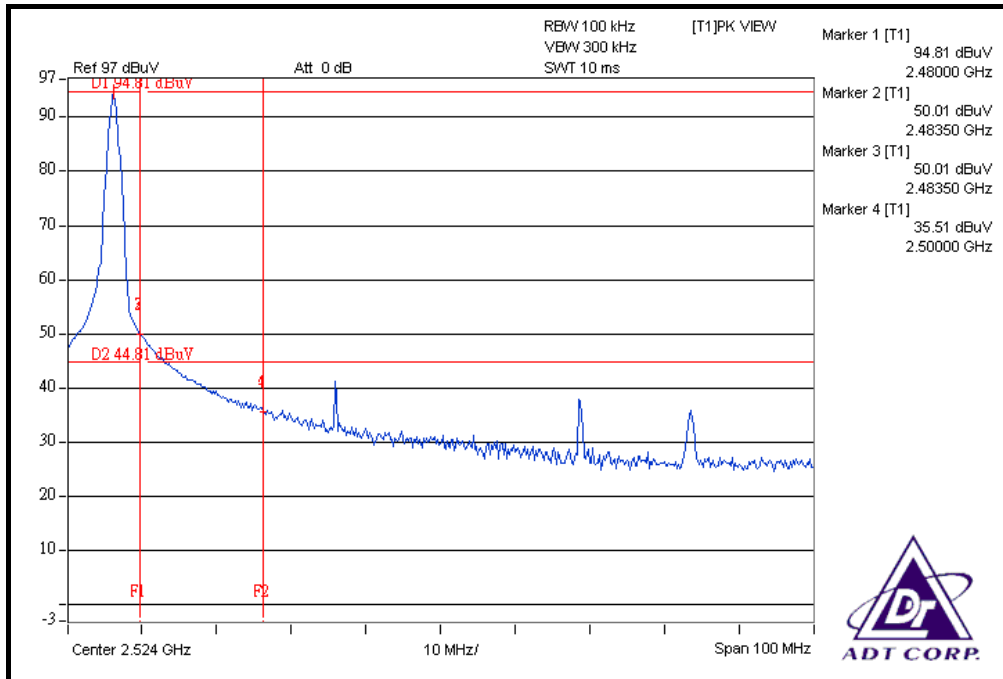


### 4.3.6 TEST RESULTS

The spectrum plots are attached on the following 4 images. D1 line indicates the highest level, and D2 line indicates the 50dB offset below D1. It shows compliance with the requirement in part 15.249 (d).









## 5. PHOTOGRAPHS OF THE TEST CONFIGURATION

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



## 6. INFORMATION ON THE TESTING LABORATORIES

We, ADT Corp., were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

<b>USA</b>	FCC, UL
<b>Germany</b>	TUV Rheinland
<b>Japan</b>	VCCI
<b>Norway</b>	NEMKO
<b>Canada</b>	INDUSTRY CANADA, CSA
<b>R.O.C.</b>	TAF, BSMI, NCC
<b>Netherlands</b>	Telefication
<b>Singapore</b>	GOST-ASIA(MOU)
<b>Russia</b>	CERTIS(MOU)

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: [www.adt.com.tw/index.5/phtml](http://www.adt.com.tw/index.5/phtml). If you have any comments, please feel free to contact us at the following:

### **Linko EMC/RF Lab**

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Fax: 886-2-26051924

### **Hsin Chu EMC/RF Lab**

Tel: 886-3-5935343

Fax: 886-3-5935342

### **Hwa Ya EMC/RF/Safety Telecom Lab**

Tel: 886-3-3183232

Fax: 886-3-3185050

**Web Site:** [www.adt.com.tw](http://www.adt.com.tw)

The address and road map of all our labs can be found in our web site also



## **7. APPENDIX A - MODIFICATIONS 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---**