# FCC TEST REPORT

**REPORT NO.:** RF951106H06
**MODEL NO.:** BCB-210X, TVP-SP4
**RECEIVED:** Nov. 06, 2006
**TESTED:** Nov. 22 to 29, 2006
**ISSUED:** Nov. 30, 2006

**APPLICANT:** U-MEDIA Communications, Inc.

**ADDRESS:** 9F, No.1, Jin-shan 7th St., Hsinchu 300, Taiwan, R.O.C.

**ISSUED BY:** Advance Data Technology Corporation

**LAB LOCATION:** No. 81-1, Lu Liao Keng, 9 Ling, Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien, Taiwan, R.O.C.



0536

No. 2177-01

# TABLE OF CONTENTS

# 1 CERTIFICATION

| | |
|---|---|
| **PRODUCT :** | Bluetooth Conference Bridge, ClearSky Bluetooth VoIP Conference Phone |
| **BRAND NAME :** | U-MEDiA, Trendnet |
| **MODEL NO. :** | BCB-210X, TVP-SP4 |
| **APPLICANT :** | U-MEDIA Communications, Inc. |
| **TESTED DATE:** | Nov. 22 to 29, 2006 |
| **TEST ITEM :** | ENGINEERING SAMPLE |
| **STANDARDS :** | 47 CFR Part 15, Subpart C (Section 15.247), ANSI C63.4-2003 |

The above equipment (Model: BCB-210X) has 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 :** Claire Kuan , **DATE:** Nov. 30, 2006
( Claire Kuan )

**TECHNICAL ACCEPTANCE :** Hank Chung , **DATE:** Nov. 30, 2006
Responsible for RF
( Hank Chung )

**APPROVED BY :** May Chen , **DATE:** Nov. 30, 2006
(May Chen, Deputy Manager )

# 2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: 47 CFR Part 15, Subpart C | | | |
|---|---|---|---|
| **Standard Section** | **Test Type and Limit** | **Result** | **REMARK** |
| 15.207 | AC Power Conducted Emission | PASS | Meet the requirement of limit Minimum passing margin is –12.17dB at 0.177 MHz |
| 15.247(a)(1)(I)-(ii) | Number of Hopping Frequency Used Spec.: At least 15 channels | PASS | Meet the requirement of limit |
| 15.247(a)(1)(ii) | Dwell Time on Each Channel Spec. : Max. 0.4 second within 31.6 second | PASS | Meet the requirement of limit |
| 15.247(a)(1)(I)-(ii) | Hopping Channel Separation Spec. : Min. 25 kHz or two-thirds of 20 dB bandwidth, which ever is greater | PASS | Meet the requirement of limit |
| 15.247(a)(2) | Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System | PASS | Report reference |
| 15.247(b) | Maximum Peak Output Power Spec.: max. 125mW | PASS | Meet the requirement of limit |
| 15.247(c) | Transmitter Radiated Emissions Spec.: Table 15.209 | PASS | Meet the requirement of limit Minimum passing margin is –1.1dB at 12010.00MHz |
| 15.247(c) | Band Edge Measurement | PASS | Meet the requirement of limit |

# 3 GENERAL INFORMATION

## 3.1 GENERAL DESCRIPTION OF EUT

| | |
|---|---|
| **PRODUCT** | Bluetooth Conference Bridge, ClearSky Bluetooth VoIP Conference Phone |
| **MODEL NO.** | BCB-210X, TVP-SP4 |
| **FCC ID** | SI5BCB210 |
| **POWER SUPPLY** | 3.7VDC from battery or<br>DC 5V from power adapter or<br>DC 5V from host equipment |
| **MODULATION TYPE** | GFSK |
| **MODULATION TECHNOLOGY** | FHSS |
| **FREQUENCY RANGE** | 2402MHz ~ 2480MHz |
| **NUMBER OF CHANNEL** | 79 |
| **OUTPUT POWER** | 51.404 mW |
| **ANTENNA TYPE** | For Bluetooth: Dipole antenna, Gain 2dBi |
| **DATA CABLE** | USB cable (1.0m/Unshielded) |
| **I/O PORTS** | USB port x1 |
| **ASSOCIATED DEVICES** | Power adapter x 1<br>USB Data Cable x 1<br>USB dongle x 1(Model: TBW-104UB/J, FCC ID: S9ZTBW104UB) |

**NOTE:**

1. The EUT has two model names which are identical to each other in all aspects except for the followings:

| Product | Brand | Model Name | Description |
|---|---|---|---|
| Bluetooth Conference Bridge | U-MEDiA | BCB-210X | The EUT color is black |
| ClearSky Bluetooth VoIP Conference Phone | Trendnet | TVP-SP4 | The EUT color is blue |

From the above models, model: **BCB-210X** was selected as representative model for the test and its data was recorded in this report.

2. The EUT could be supplied with 3.7V Lithium battery or the following power adapter:

| **Adapter :** | |
|---|---|
| Brand: | DVE |
| Model No.: | DSA-5P-05 FUS 050100 |
| Input power : | AC100V-240V, 50/60Hz 0.2A |
| Output power : | 5V DC, 1A |
| **Battery :** | |
| Brand: | HECELL |
| Model No.: | H303482 |
| Rating: | 3.7V |

3. The EUT was pre-tested in chamber as the following test modes:

| **For conducted and radiated emissions** | |
|---|---|
| **Test Mode** | **Power source** |
| Mode A | With Battery |
| Mode B | With Adapter |
| Mode C | With USB cable (from Notebook computer) |

The worst conducted emissions were found in Mode B and Mode C. The worst radiated emissions was found in Mode C. The final test was executed under test mode with highest emission and recorded in this report individually.

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

Seventy-nine channels are provided to this EUT.

| Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|---|---|---|---|---|---|---|---|
| 0 | 2402 | 20 | 2422 | 40 | 2442 | 60 | 2462 |
| 1 | 2403 | 21 | 2423 | 41 | 2443 | 61 | 2463 |
| 2 | 2404 | 22 | 2424 | 42 | 2444 | 62 | 2464 |
| 3 | 2405 | 23 | 2425 | 43 | 2445 | 63 | 2465 |
| 4 | 2406 | 24 | 2426 | 44 | 2446 | 64 | 2466 |
| 5 | 2407 | 25 | 2427 | 45 | 2447 | 65 | 2467 |
| 6 | 2408 | 26 | 2428 | 46 | 2448 | 66 | 2468 |
| 7 | 2409 | 27 | 2429 | 47 | 2449 | 67 | 2469 |
| 8 | 2410 | 28 | 2430 | 48 | 2450 | 68 | 2470 |
| 9 | 2411 | 29 | 2431 | 49 | 2451 | 69 | 2471 |
| 10 | 2412 | 30 | 2431 | 50 | 2452 | 70 | 2472 |
| 11 | 2413 | 31 | 2433 | 51 | 2453 | 71 | 2473 |
| 12 | 2414 | 32 | 2434 | 52 | 2454 | 72 | 2474 |
| 13 | 2415 | 33 | 2435 | 53 | 2455 | 73 | 2475 |
| 14 | 2416 | 34 | 2436 | 54 | 2456 | 74 | 2476 |
| 15 | 2417 | 35 | 2437 | 55 | 2457 | 75 | 2477 |
| 16 | 2418 | 36 | 2438 | 56 | 2458 | 76 | 2478 |
| 17 | 2419 | 37 | 2439 | 57 | 2459 | 77 | 2479 |
| 18 | 2420 | 38 | 2440 | 58 | 2460 | 78 | 2480 |
| 19 | 2421 | 39 | 2441 | 59 | 2461 | | |

**NOTE:**
The EUT was tested with the following modes:

| **For conducted emission** | |
|---|---|
| **Test Mode** | **Power source** |
| Mode 1 | With Adapter |
| Mode 2 | With USB cable |
| **For radiated emission** | |
| **Test Mode** | **Power source** |
| Mode 1 | With USB cable |
| **For other tests** | |
| **Test Mode** | **Power source** |
| Mode 1 | With USB cable |

## 3.3 Test Mode Applicability and tested channel detail

| EUT CONFIGURE MODE | Applicable to | | | | Description |
|---|---|---|---|---|---|
| | PLC | RE<1G | RE≥1G | APCM | |
| - | √ | √ | √ | √ | NA |

Where **PLC:** Power Line Conducted Emission **RE<1G:** Radiated Emission below 1GHz

**RE≥1G:** Radiated Emission above 1GHz **APCM:** Antenna Port Conducted Measurement

**POWER LINE CONDUCTED EMISSION TEST:**

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types.

☒ Following channel(s) was (were) selected for the final test as listed below.

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | PACKET TYPE |
|---|---|---|---|---|
| 0 to 78 | 78 | FHSS | GFSK | DH5 |

**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 packet types.

☒ Following channel(s) was (were) selected for the final test as listed below.

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | PACKET TYPE |
|---|---|---|---|---|
| 0 to 78 | 78 | FHSS | GFSK | DH5 |

**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 packet types.

☒ Following channel(s) was (were) selected for the final test as listed below.

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | PACKET TYPE |
|---|---|---|---|---|
| 0 to 78 | 0, 39, 78 | FHSS | GFSK | DH5 |

**BANDEDGE MEASUREMENT:**

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types.

☒ Following channel(s) was (were) selected for the final test as listed below.

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | PACKET TYPE |
|---|---|---|---|---|
| 0 to 78 | 0, 78 | FHSS | GFSK | DH5 |

**ANTENNA PORT CONDUCTED MEASUREMENT:**

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types.

☒ Following channel(s) was (were) selected for the final test as listed below.

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | PACKET TYPE |
|---|---|---|---|---|
| 0 to 78 | 0, 39, 78 | FHSS | GFSK | DH5 |

## 3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

**FCC Part 15, Subpart C. (15.247)**
**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.

## 3.5 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.

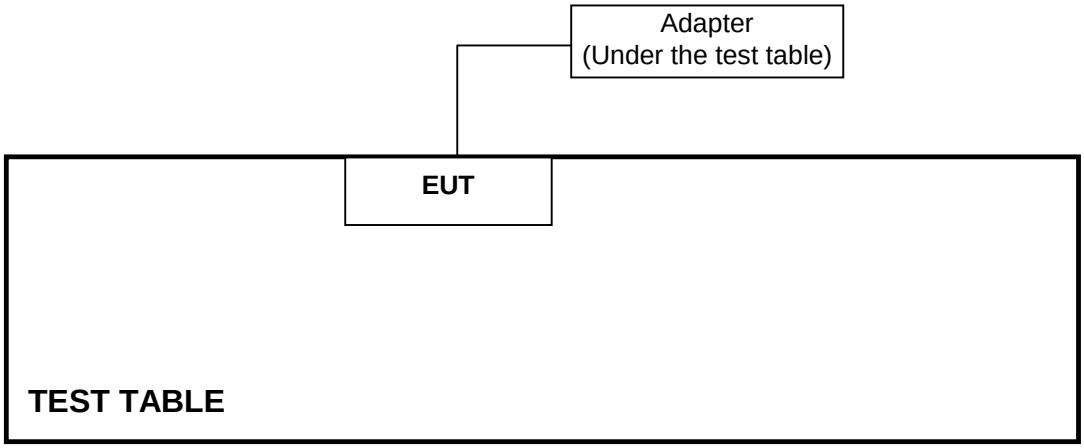
| No. | Product | Brand | Model No. | Serial No. | FCC ID |
|---|---|---|---|---|---|
| 1 | Notebook Computer | DELL (For radiated) | Latitude C600/C500 | TW-09C748-12800-1A3-1999 | DoC |
| | Notebook Computer | DELL (For conducted) | PP21L | CN-0GD366-70166-5B3-09ZX | DoC |

| No. | Signal cable description |
|---|---|
| 1 | NA |

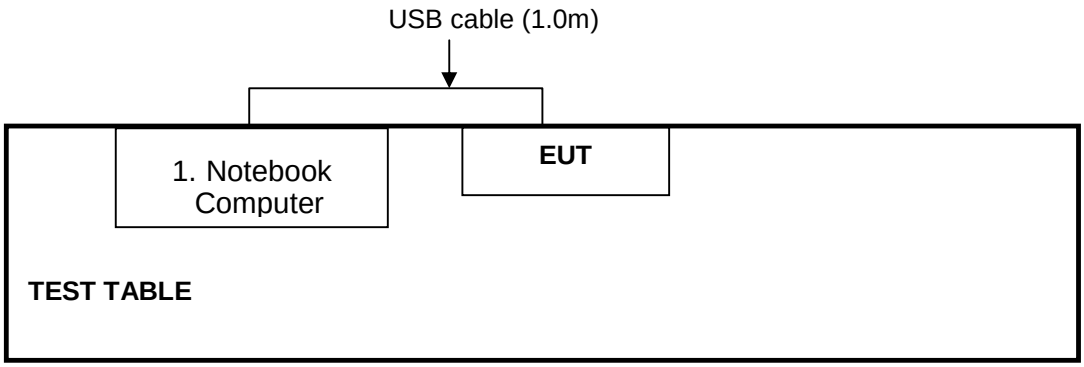
Note: 1. All power cords of the above support units are unshielded (1.8m).

## 3.6 CONFIGURATION OF SYSTEM UNDER TEST

**For conducted emission (Mode 1):**

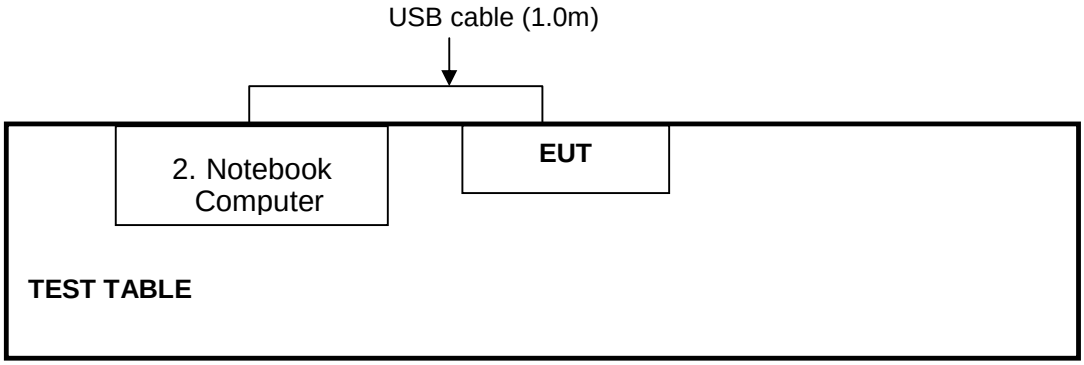



**For conducted emission (Mode 2):**




**NOTE:** 1. Please refer to the photos of test configuration in Item 5 also.

**For radiated emission:**




**NOTE:** 1. Please refer to the photos of test configuration in Item 5 also.

# 4 TEST PROCEDURES AND RESULTS

## 4.1 CONDUCTED EMISSION MEASUREMENT

### 4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

| FREQUENCY OF EMISSION (MHz) | CONDUCTED LIMIT (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5<br>0.5-5<br>5-30 | 66 to 56<br>56<br>60 | 56 to 46<br>46<br>50 |

Notes:

1. The lower limit shall apply at the transition frequencies.
2. 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.

### 4.1.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED UNTIL |
|---|---|---|---|
| ROHDE & SCHWARZ<br>Test Receiver | ESCS 30 | 100287 | Feb. 20, 2007 |
| Line-Impedance Stabilization Network(for EUT) | ESH3-Z5 | 848773/004 | Oct. 26, 2007 |
| Line-Impedance Stabilization Network(for Peripheral) | ENV-216 | 100072 | Oct. 26, 2007 |
| RF Cable (JETBAO) | RG233/U | Cable_CA_01 | Jul. 19, 2007 |
| Terminator | 50 | 1 | Oct. 30, 2007 |
| Software | ADT_Cond_V7.3.2 | NA | NA |

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in ADT Shielded Room No. A.
3. The VCCI Con A Registration No. is C-817.

### 4.1.3 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.

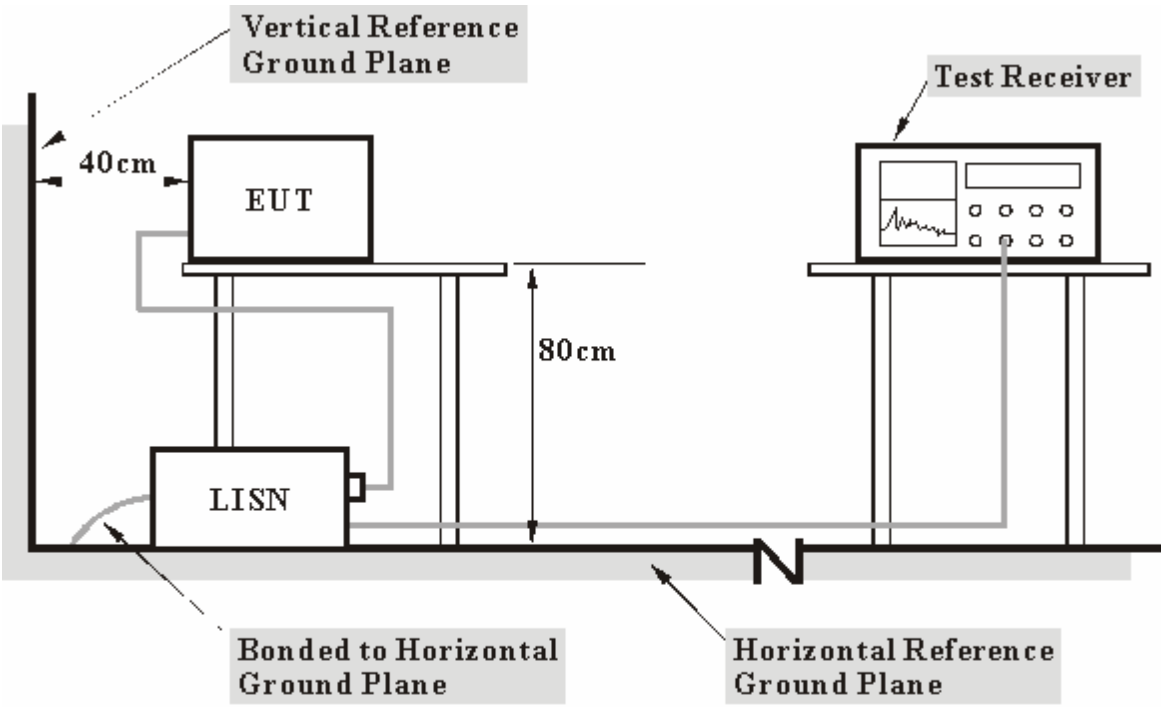
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

c. The frequency range from 150kHz to 30MHz was searched. Emission levels under Limit - 20dB was not recorded.

### 4.1.4 DEVIATION FROM TEST STANDARD

No deviation

### 4.1.5 TEST SETUP




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

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

### 4.1.6 EUT OPERATING CONDITIONS

**For conducted emission (Mode 1):**

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

**For conducted emission (Mode 2):**

a. Placed the EUT on the testing table.

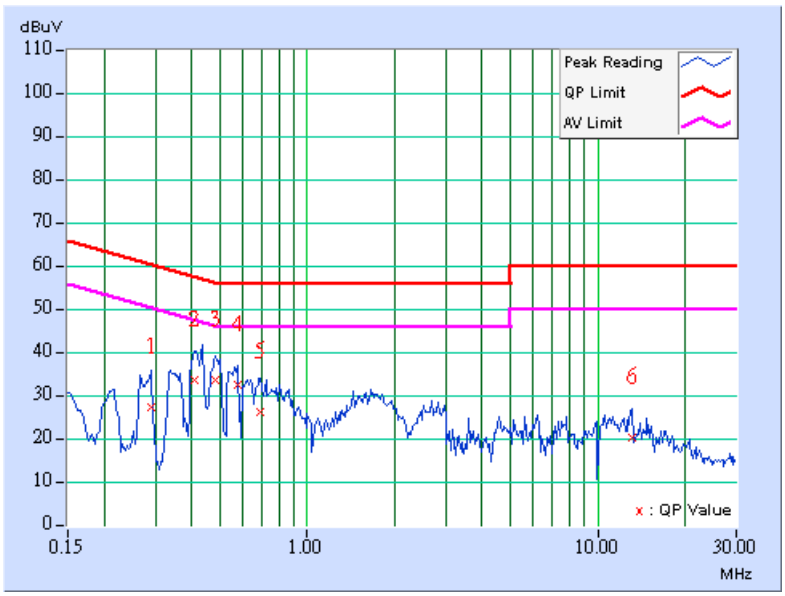
b. The support unit 1 (Notebook computer) ran a test program “CSR bluetest” to enable EUT under transmission condition continuously at specific channel frequency.

## 4.1.7 TEST RESULTS-MODE 1

| | | | |
|---|---|---|---|
| **TEST MODE** | Mode 1 | **6dB BANDWIDTH** | 9 kHz |
| **INPUT POWER (SYSTEM)** | 120Vac, 60 Hz | **PHASE** | Line (L) |
| **ENVIRONMENTAL CONDITIONS** | 21 deg. C, 50%RH, 960 hPa | **TESTED BY** | Sky Liao |

| No | Freq. | Corr. Factor | Reading Value [dB (uV)] | | Emission Level [dB (uV)] | | Limit [dB (uV)] | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | [MHz] | (dB) | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.291 | 0.35 | 26.88 | - | 27.23 | - | 60.51 | 50.51 | -33.27 | - |
| 2 | 0.408 | 0.30 | 33.15 | - | 33.45 | - | 57.69 | 47.69 | -24.24 | - |
| 3 | 0.482 | 0.30 | 33.15 | - | 33.45 | - | 56.30 | 46.30 | -22.85 | - |
| 4 | 0.576 | 0.30 | 31.86 | - | 32.16 | - | 56.00 | 46.00 | -23.84 | - |
| 5 | 0.689 | 0.30 | 25.52 | - | 25.82 | - | 56.00 | 46.00 | -30.18 | - |
| 6 | 13.063 | 0.68 | 19.61 | - | 20.29 | - | 60.00 | 50.00 | -39.71 | - |

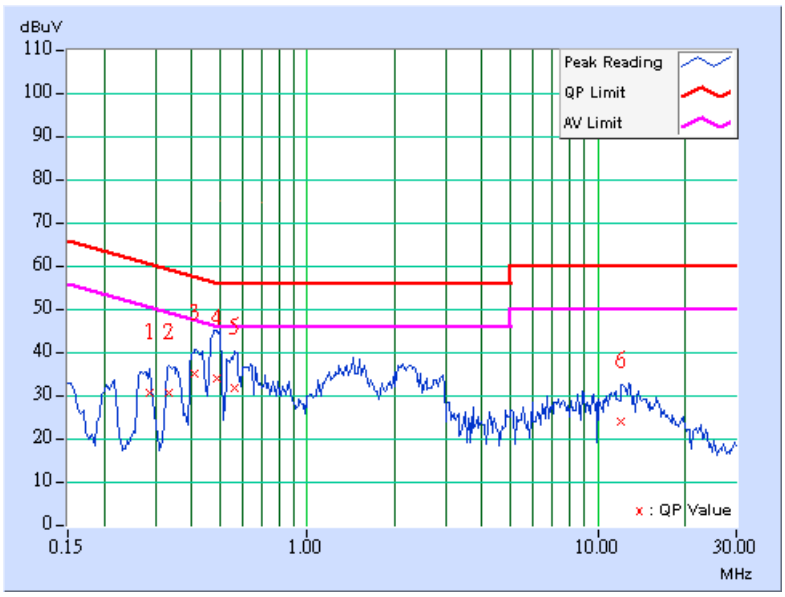
**REMARKS:** 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value =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



| | | | |
|---|---|---|---|
| **TEST MODE** | Mode 1 | **6dB BANDWIDTH** | 9 kHz |
| **INPUT POWER (SYSTEM)** | 120Vac, 60 Hz | **PHASE** | Neutral (N) |
| **ENVIRONMENTAL CONDITIONS** | 21 deg. C, 50%RH, 960 hPa | **TESTED BY** | Sky Liao |

| No | Freq. | Corr. Factor | Reading Value [dB (uV)] | | Emission Level [dB (uV)] | | Limit [dB (uV)] | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | [MHz] | (dB) | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.287 | 0.36 | 29.94 | - | 30.30 | - | 60.62 | 50.62 | -30.32 | - |
| 2 | 0.334 | 0.33 | 30.19 | - | 30.52 | - | 59.36 | 49.36 | -28.84 | - |
| 3 | 0.412 | 0.30 | 34.64 | - | 34.94 | - | 57.61 | 47.61 | -22.67 | - |
| 4 | 0.486 | 0.31 | 33.49 | - | 33.80 | - | 56.24 | 46.24 | -22.43 | - |
| 5 | 0.560 | 0.33 | 31.23 | - | 31.56 | - | 56.00 | 46.00 | -24.44 | - |
| 6 | 12.043 | 0.68 | 23.52 | - | 24.20 | - | 60.00 | 50.00 | -35.80 | - |

**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.

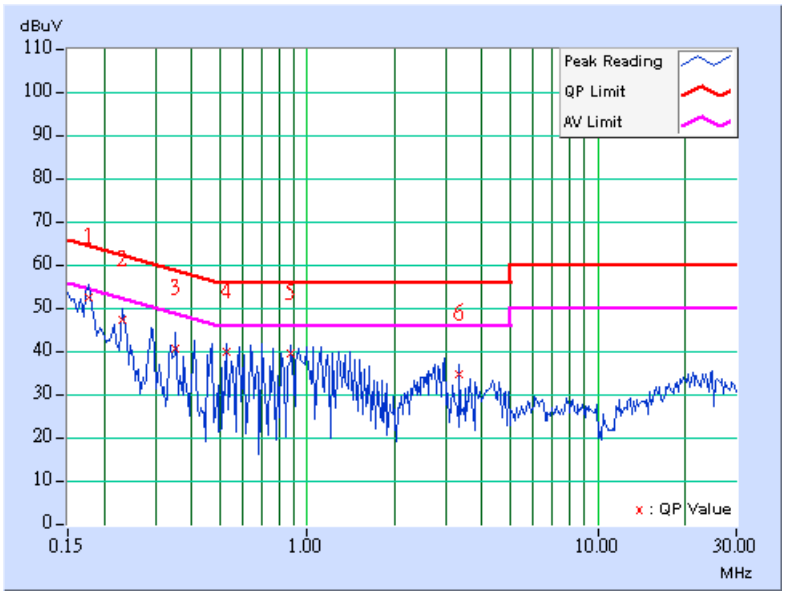


## 4.1.8 TEST RESULTS-MODE 2

| | | | |
|---|---|---|---|
| **TEST MODE** | Mode 2 | **6dB BANDWIDTH** | 9 kHz |
| **INPUT POWER (SYSTEM)** | 120Vac, 60 Hz | **PHASE** | Line (L) |
| **ENVIRONMENTAL CONDITIONS** | 21 deg. C, 50%RH, 960 hPa | **TESTED BY** | Sky Liao |

| No | Freq. | Corr. Factor | Reading Value [dB (uV)] | | Emission Level [dB (uV)] | | Limit [dB (uV)] | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | [MHz] | (dB) | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| **1** | **0.177** | **0.58** | **51.86** | **-** | **52.44** | **-** | **64.61** | **54.61** | **-12.17** | **-** |
| 2 | 0.232 | 0.60 | 46.61 | - | 47.21 | - | 62.38 | 52.38 | -15.17 | - |
| 3 | 0.353 | 0.60 | 40.11 | - | 40.71 | - | 58.89 | 48.89 | -18.18 | - |
| 4 | 0.525 | 0.62 | 39.06 | - | 39.68 | - | 56.00 | 46.00 | -16.32 | - |
| 5 | 0.877 | 0.68 | 39.03 | - | 39.71 | - | 56.00 | 46.00 | -16.29 | - |
| 6 | 3.332 | 0.77 | 33.89 | - | 34.66 | - | 56.00 | 46.00 | -21.34 | - |

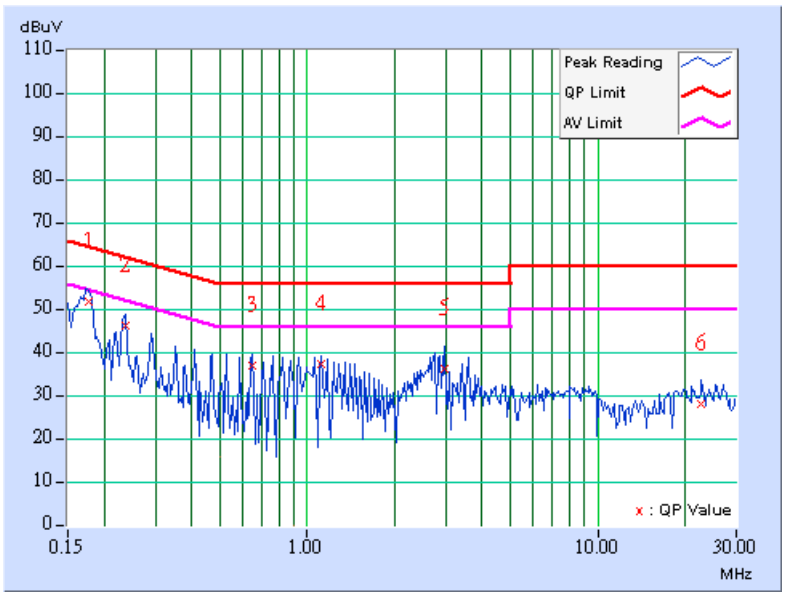
**REMARKS:** 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value =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



| | | | |
|---|---|---|---|
| **TEST MODE** | Mode 2 | **6dB BANDWIDTH** | 9 kHz |
| **INPUT POWER (SYSTEM)** | 120Vac, 60 Hz | **PHASE** | Neutral (N) |
| **ENVIRONMENTAL CONDITIONS** | 21 deg. C, 50%RH, 960 hPa | **TESTED BY** | Sky Liao |

| No | Freq. | Corr. Factor | Reading Value [dB (uV)] | | Emission Level [dB (uV)] | | Limit [dB (uV)] | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | [MHz] | (dB) | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.177 | 0.42 | 50.87 | - | 51.29 | - | 64.61 | 54.61 | -13.32 | - |
| 2 | 0.236 | 0.38 | 45.33 | - | 45.71 | - | 62.24 | 52.24 | -16.53 | - |
| 3 | 0.646 | 0.34 | 36.17 | - | 36.51 | - | 56.00 | 46.00 | -19.49 | - |
| 4 | 1.111 | 0.40 | 36.31 | - | 36.71 | - | 56.00 | 46.00 | -19.29 | - |
| 5 | 2.986 | 0.40 | 35.39 | - | 35.79 | - | 56.00 | 46.00 | -20.21 | - |
| 6 | 22.764 | 0.96 | 27.34 | - | 28.30 | - | 60.00 | 50.00 | -31.70 | - |

**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.



## 4.2 NUMBER OF HOPPING FREQUENCY USED

### 4.2.1 LIMIT OF HOPPING FREQUENCY USED

At least 15 hopping frequencies, and should be equally spaced.

### 4.2.2 TEST INSTRUMENTS

| Description & Manufacturer | Model No. | Serial No. | Calibrated Until |
|---|---|---|---|
| R&S SPECTRUM ANALYZER | FSP40 | 100036 | Dec. 09, 2006 |

**Note:**

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

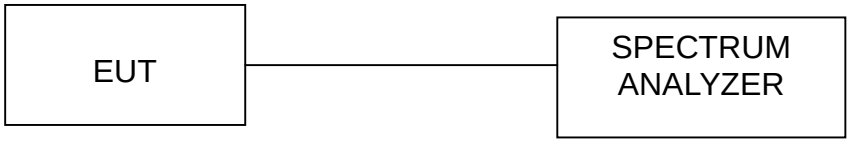
### 4.2.3 TEST PROCEDURES

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
4. Set the SA on View mode and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

### 4.2.4 DEVIATION FROM TEST STANDARD

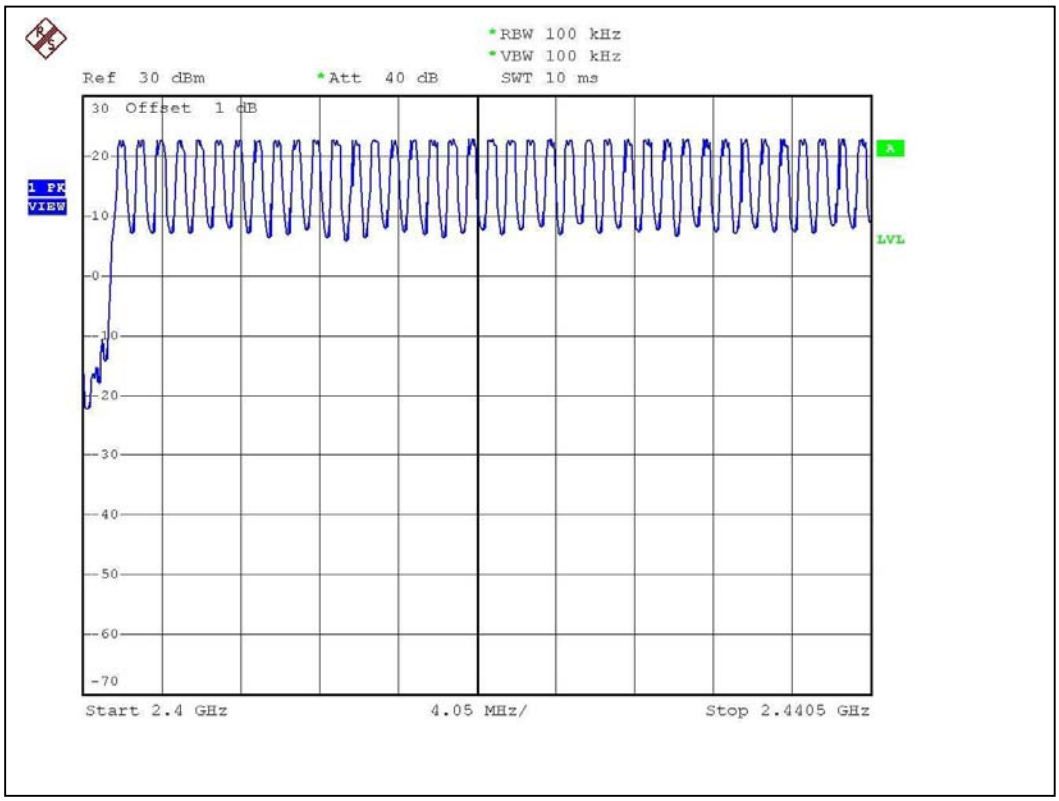
No deviation

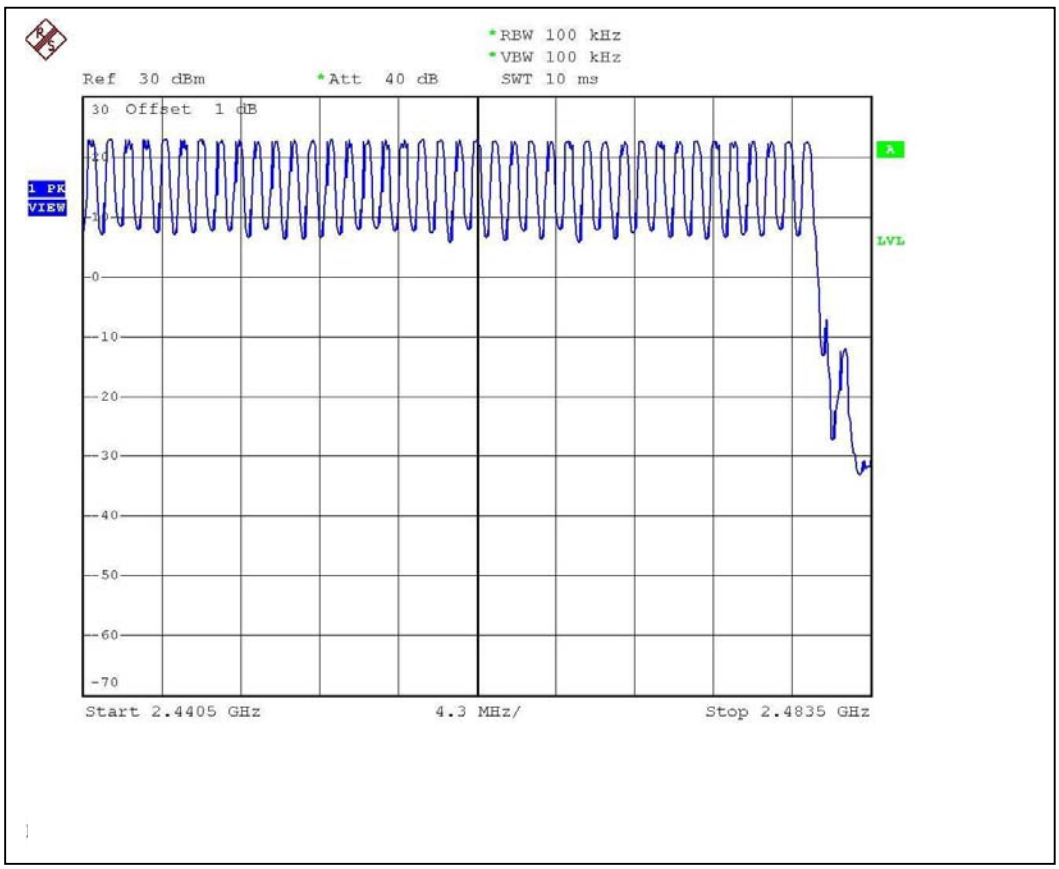
### 4.2.5 TEST SETUP




### 4.2.6 TEST RESULTS

There are 79 hopping frequencies in the hopping mode. Please refer to next two pages for the test result. On the plots, it shows that the hopping frequencies are equally spaced.


*RBW 100 kHz
*VBW 100 kHz
Ref 30 dBm
*Att 40 dB
SWT 10 ms
30 Offset 1 dB
1 PK
VIEW
A
LVL
-20
-10
0
10
20
30
40
50
60
-70
Start 2.4 GHz
4.05 MHz/
Stop 2.4405 GHz


*RBW 100 kHz
*VBW 100 kHz
Ref 30 dBm
*Att 40 dB
SWT 10 ms
30 Offset 1 dB
1 PK
VIEW
A
LVL
20
10
0
10
20
30
40
50
60
-70
Start 2.4405 GHz
4.3 MHz/
Stop 2.4835 GHz

## 4.3 DWELL TIME ON EACH CHANNEL

### 4.3.1 LIMIT OF DWELL TIME USED

For FHSS, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 31.6 second period. For hybrid systems, the average time of occupancy on any frequency should not exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4.

### 4.3.2 TEST INSTRUMENTS

| Description & Manufacturer | Model No. | Serial No. | Calibrated Until |
|---|---|---|---|
| R&S SPECTRUM ANALYZER | FSP40 | 100036 | Dec. 09, 2006 |

**Note:**

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. 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 PROCEDURES

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
5. Repeat above procedures until all frequencies measured were complete.

### 4.3.4 DEVIATION FROM TEST STANDARD

No deviation

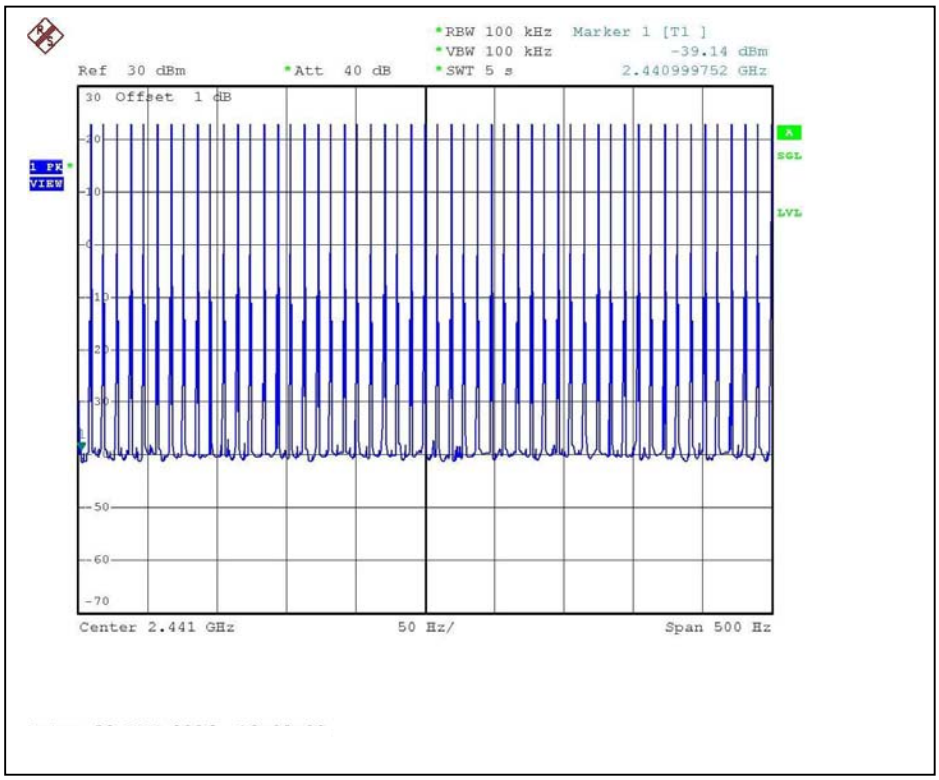
### 4.3.5 TEST SETUP

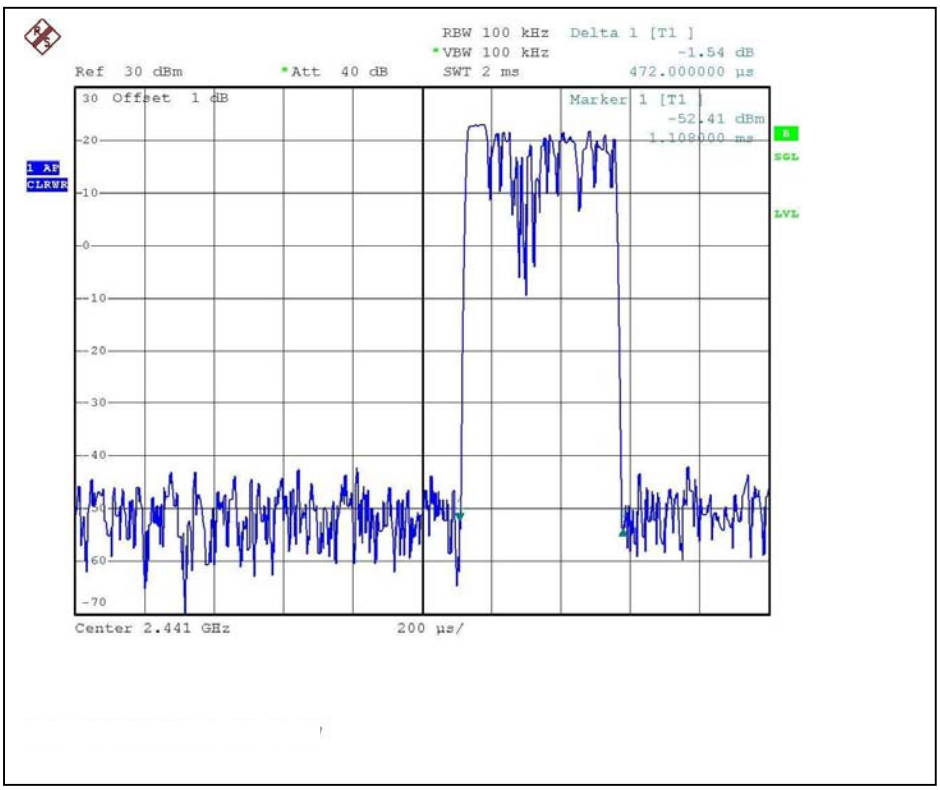
### 4.3.6 TEST RESULTS

| Mode | Number of transmission in a 31.6 (79Hopping*0.4) | Length of transmission time (msec) | Result (msec) | Limit (msec) |
|---|---|---|---|---|
| DH1 | 52 (times / 5 sec) *6.32=328.64 times | 0.47 | 154.4608 | 400 |
| DH3 | 26 (times / 5 sec) *6.32=164.32 times | 1.77 | 290.8464 | 400 |
| DH5 | 17 (times / 5 sec) *6.32=107.44 times | 3.01 | 323.3944 | 400 |

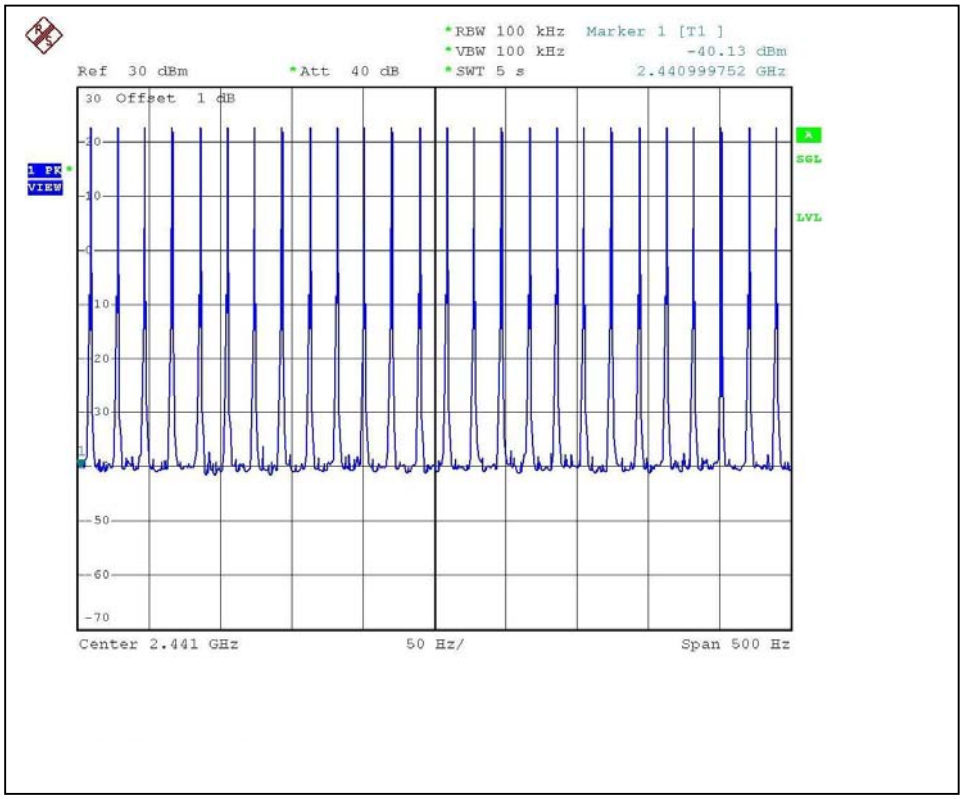
Test plots of the transmitting time slot are shown on next three pages.

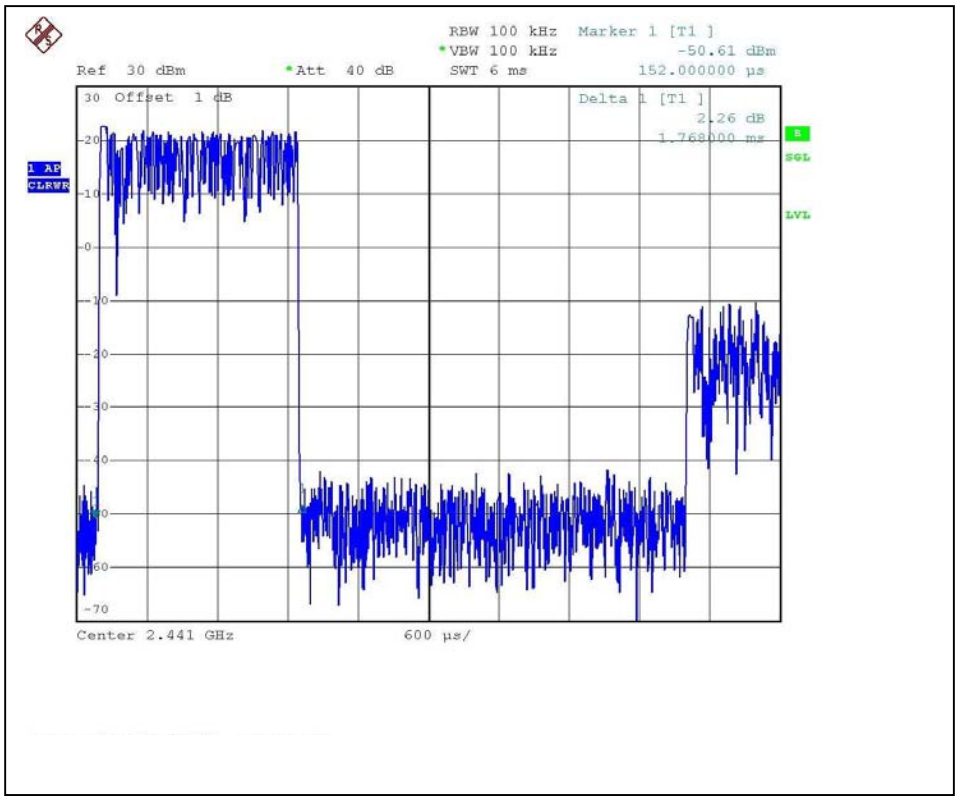
## DH1


RBW 100 kHz
VBW 100 kHz
SWT 5 s
Marker 1 [T1 ]
-39.14 dBm
2.440999752 GHz
Ref 30 dBm
Att 40 dB
30 Offset 1 dB
1 PK VIEW
A
SGL
LVL
-20
-10
0
10
20
30
-50
-60
-70
Center 2.441 GHz
50 Hz/
Span 500 Hz

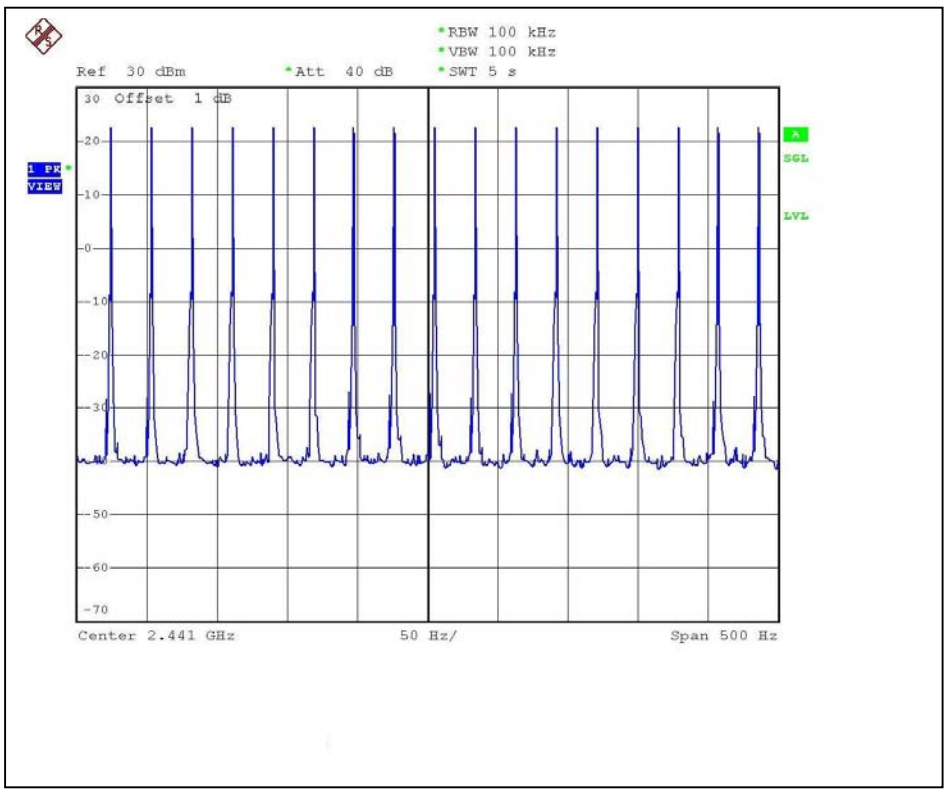

RBW 100 kHz
VBW 100 kHz
SWT 2 ms
Delta 1 [T1 ]
-1.54 dB
472.000000 µs
Ref 30 dBm
Att 40 dB
30 Offset 1 dB
Marker 1 [T1 ]
-52.41 dBm
1.108000 ms
1 AP CLRWR
A
SGL
LVL
-20
-10
0
-10
-20
-30
-40
-50
-60
-70
Center 2.441 GHz
200 µs/

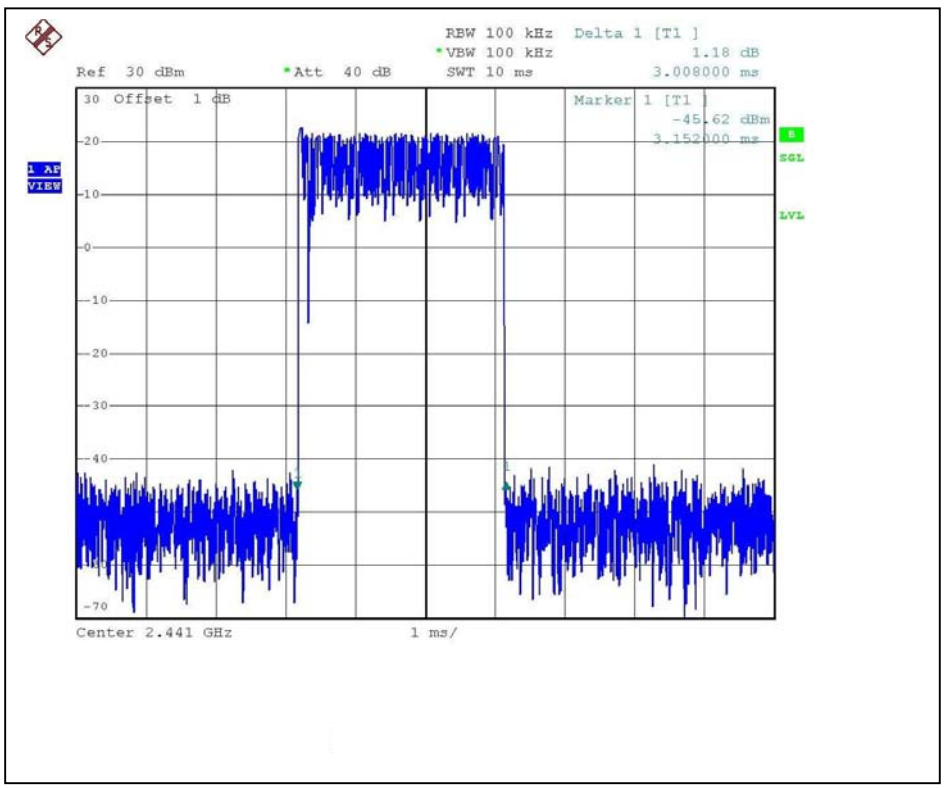
## DH3


*RBW 100 kHz
Marker 1 [T1 ]
*VBW 100 kHz
-40.13 dBm
Ref 30 dBm
*Att 40 dB
*SWT 5 s
2.440999752 GHz
30 Offset 1 dB
1 PK
VIEW
A
SGL
LVL
Center 2.441 GHz
50 Hz/
Span 500 Hz


RBW 100 kHz
Marker 1 [T1 ]
*VBW 100 kHz
-50.61 dBm
Ref 30 dBm
*Att 40 dB
SWT 6 ms
152.000000 µs
30 Offset 1 dB
Delta 1 [T1 ]
2.26 dB
1.768000 ms
1 AP
CLRWR
B
SGL
LVL
Center 2.441 GHz
600 µs/

## DH5


*RBW 100 kHz
*VBW 100 kHz
Ref 30 dBm
*Att 40 dB
*SWT 5 s
30 Offset 1 dB
1 PK VIEW
SGL
LVL
Center 2.441 GHz
50 Hz/
Span 500 Hz


RBW 100 kHz
Delta 1 [T1 ]
*VBW 100 kHz
1.18 dB
Ref 30 dBm
*Att 40 dB
SWT 10 ms
3.008000 ms
30 Offset 1 dB
Marker 1 [T1 ]
-45.62 dBm
3.152000 ms
1 AP VIEW
SGL
LVL
Center 2.441 GHz
1 ms/

## 4.4 CHANNEL BANDWIDTH

### 4.4.1 TEST INSTRUMENTS

| Description & Manufacturer | Model No. | Serial No. | Calibrated Until |
|---|---|---|---|
| R&S SPECTRUM ANALYZER | FSP40 | 100036 | Dec. 09, 2006 |

**Note:**

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

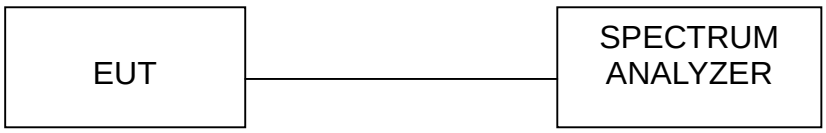
### 4.4.2 TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

### 4.4.3 DEVIATION FROM TEST STANDARD

No deviation

### 4.4.4 TEST SETUP




### 4.4.5 EUT OPERATING CONDITION

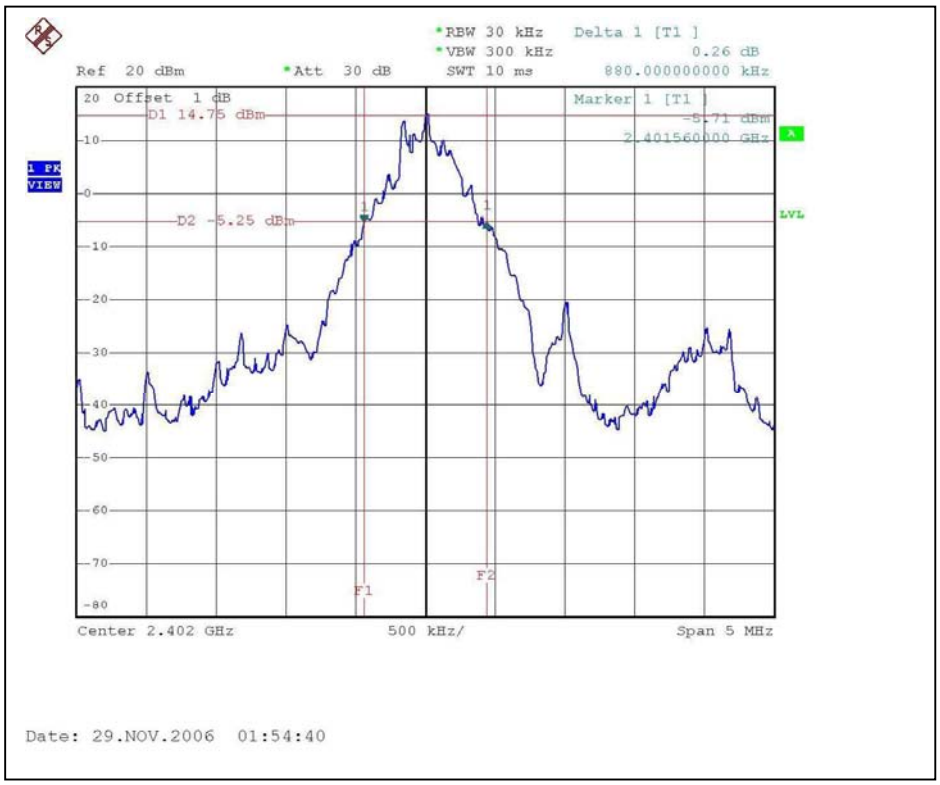
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

## 4.4.6 TEST RESULTS

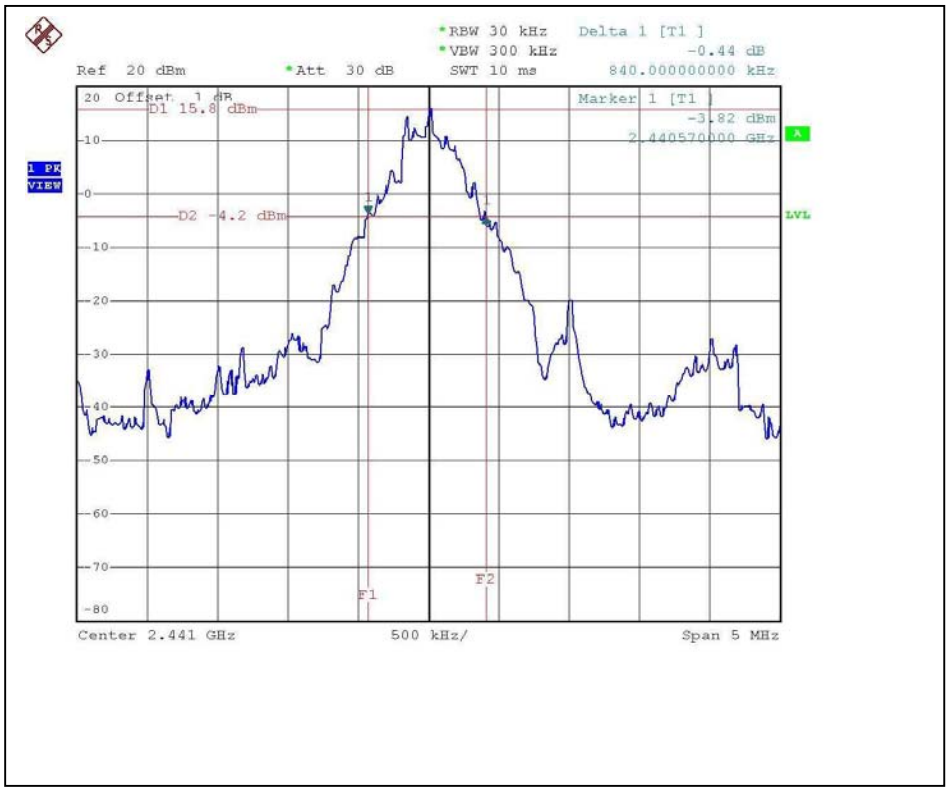
| ENVIRONMENTAL CONDITIONS | 20deg. C, 60%RH, 960 hPa | INPUT POWER (SYSTEM) | 120Vac, 60 Hz |
|---|---|---|---|
| TESTED BY | Sky Liao | | |

| CHANNEL | CHANNEL FREQUENCY (MHz) | 20dB BANDWIDTH (kHz) |
|---|---|---|
| 0 | 2402 | 880 |
| 39 | 2441 | 840 |
| 78 | 2480 | 850 |

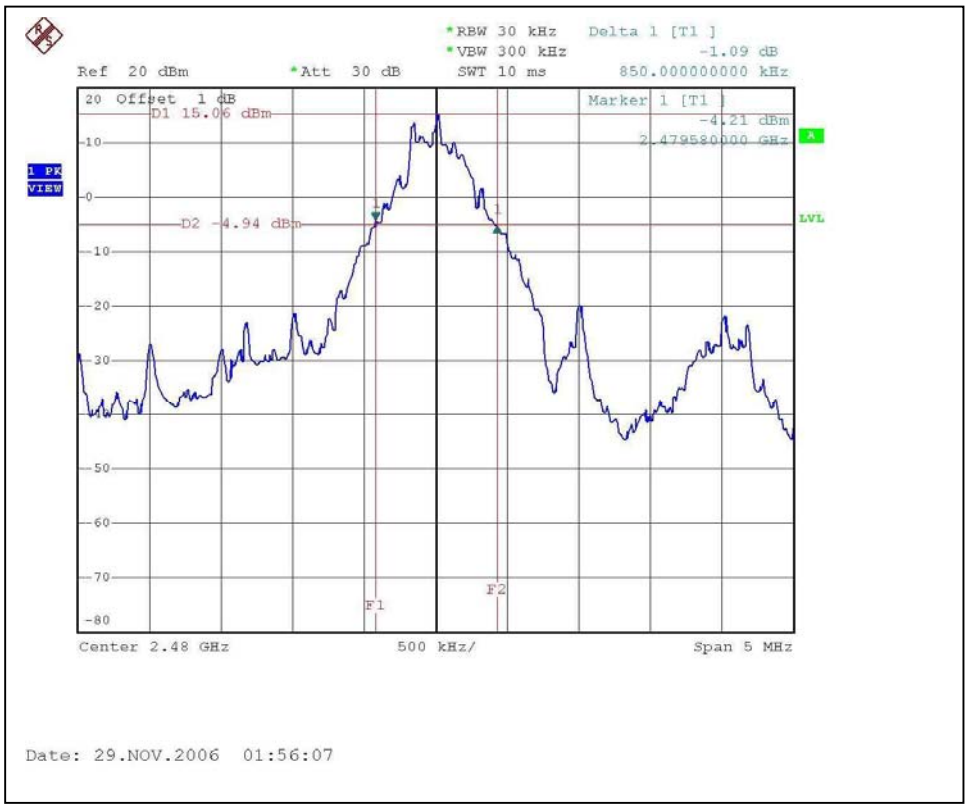
## Channel 0




## Channel 39



## Channel 78


*RBW 30 kHz
*VBW 300 kHz
SWT 10 ms
Delta 1 [T1 ]
-1.09 dB
850.000000000 kHz
Ref 20 dBm
*Att 30 dB
20 Offset 1 dB
D1 15.06 dBm
Marker 1 [T1 ]
-4.21 dBm
2.479580000 GHz
1 PK
VIEW
A
LVL
D2 -4.94 dBm
10
0
-10
-20
-30
-50
-60
-70
-80
F1
F2
Center 2.48 GHz
500 kHz/
Span 5 MHz
Date: 29.NOV.2006 01:56:07

## 4.5 HOPPING CHANNEL SEPARATION

### 4.5.1 LIMIT OF HOPPING CHANNEL SEPARATION

At least 25 kHz or two-thirds of 20dB hopping channel bandwidth (whichever is greater).

### 4.5.2 TEST INSTRUMENTS

| Description & Manufacturer | Model No. | Serial No. | Calibrated Until |
|---|---|---|---|
| R&S SPECTRUM ANALYZER | FSP40 | 100036 | Dec. 09, 2006 |

**Note:**

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

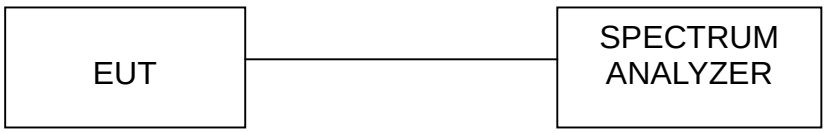
### 4.5.3 TEST PROCEDURES

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
3. By using the MaxHold function record the separation of two adjacent channels.
4. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

### 4.5.4 DEVIATION FROM TEST STANDARD

No deviation

### 4.5.5 TEST SETUP



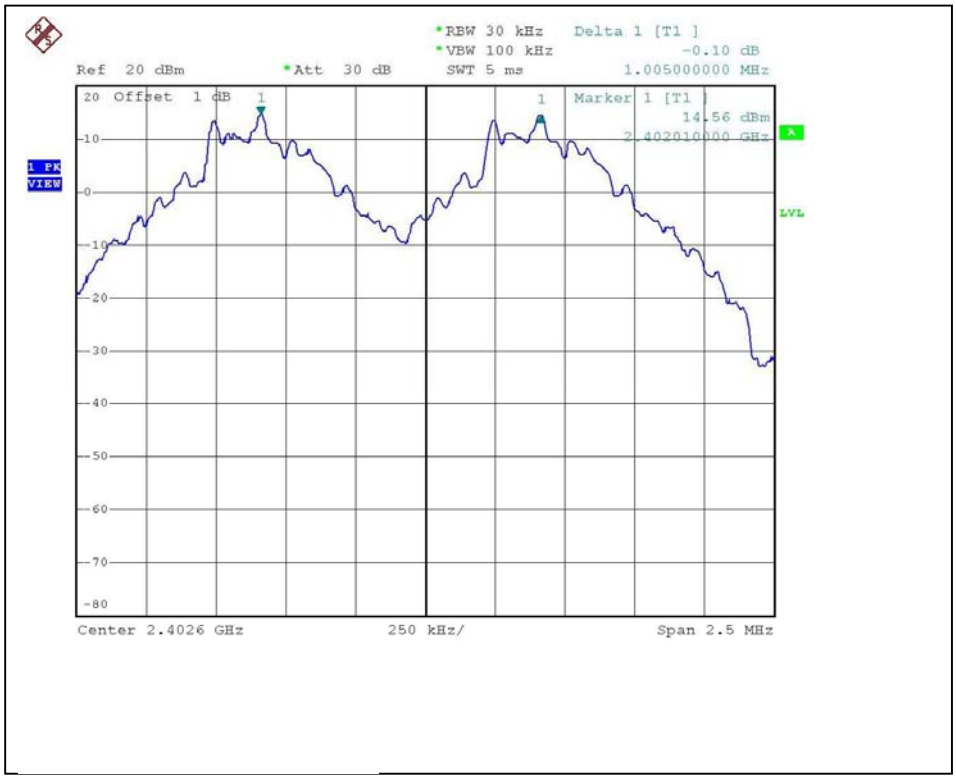
## 4.5.6 TEST RESULTS

| ENVIRONMENTAL CONDITIONS | 25deg. C, 62%RH, 960 hPa | INPUT POWER (SYSTEM) | 120Vac, 60 Hz |
|---|---|---|---|
| TESTED BY | Sky Liao | | |

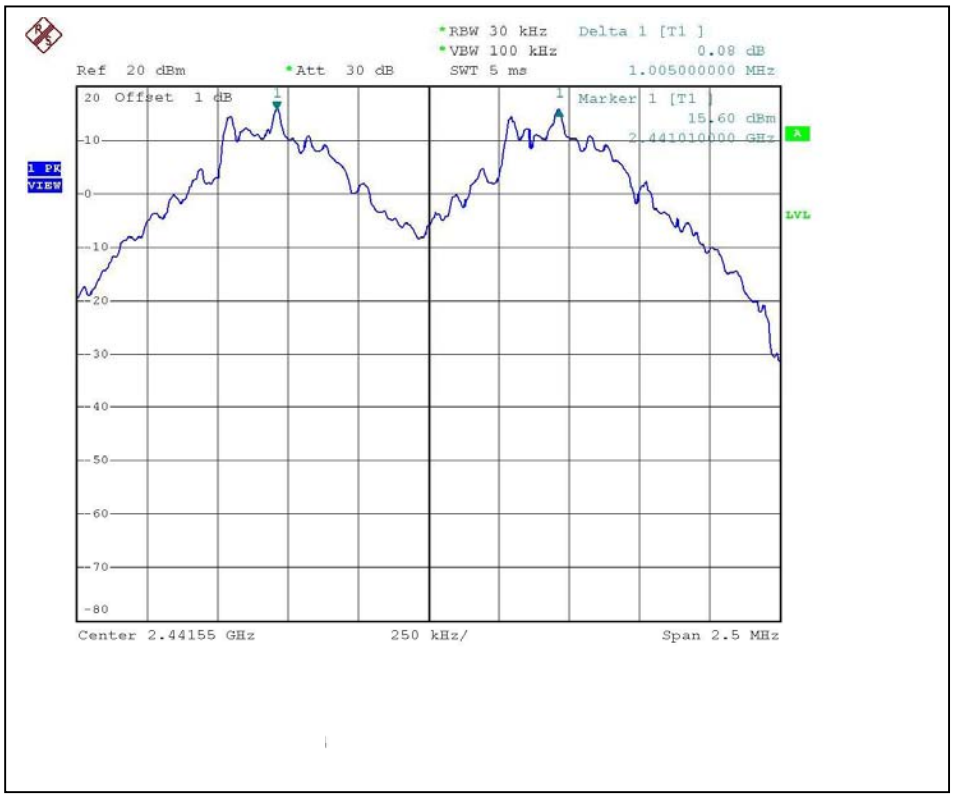
| Channel | Frequency (MHz) | Adjacent Channel Separation | Minimum Limit (kHz) | Pass / Fail |
|---|---|---|---|---|
| 0 | 2402 | 1.005MHz | 587 | PASS |
| 39 | 2441 | 1.005MHz | 560 | PASS |
| 78 | 2480 | 1.010MHz | 567 | PASS |

The minimum limit is two-thirds of 20dB bandwidth. Test results please refer to next three pages.

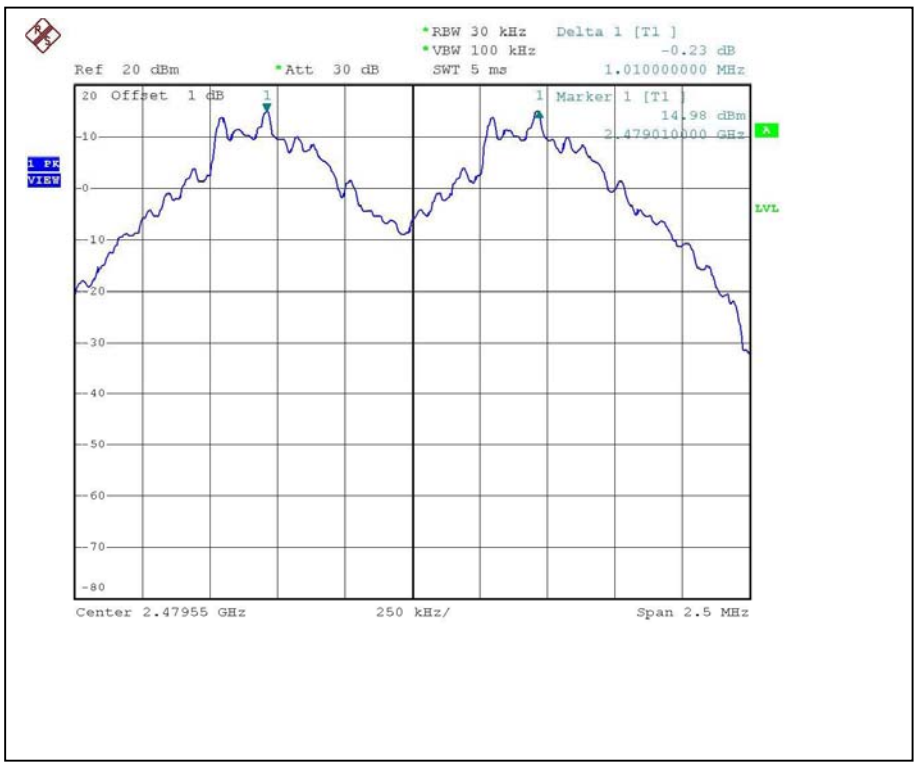
## Channel 0




## Channel 39



## Channel 78


*RBW 30 kHz
*VBW 100 kHz
SWT 5 ms
Delta 1 [T1 ]
-0.23 dB
1.010000000 MHz
Ref 20 dBm
*Att 30 dB
20 Offset 1 dB
Marker 1 [T1 ]
14.98 dBm
2.479010000 GHz
1 PK
VIEW
LVL
Center 2.47955 GHz
250 kHz/
Span 2.5 MHz

## 4.6 MAXIMUM PEAK OUTPUT POWER

### 4.6.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Measurement is 125mW.

### 4.6.2 INSTRUMENTS

| Description & Manufacturer | Model No. | Serial No. | Calibrated Until |
|---|---|---|---|
| R&S SPECTRUM ANALYZER | FSP40 | 100036 | Dec. 09, 2006 |

**Note:**

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

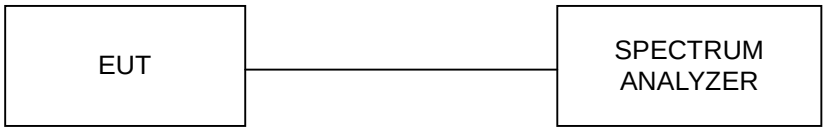
### 4.6.3 TEST PROCEDURES

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. The center frequency of the spectrum analyzer is set to the fundamental frequency and using 3 MHz RBW and 3 MHz VBW.
4. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
5. Repeat above procedures until all frequencies measured were complete.

### 4.6.4 DEVIATION FROM TEST STANDARD

No deviation

### 4.6.5 TEST SETUP




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

### 4.6.6 EUT OPERATING CONDITION

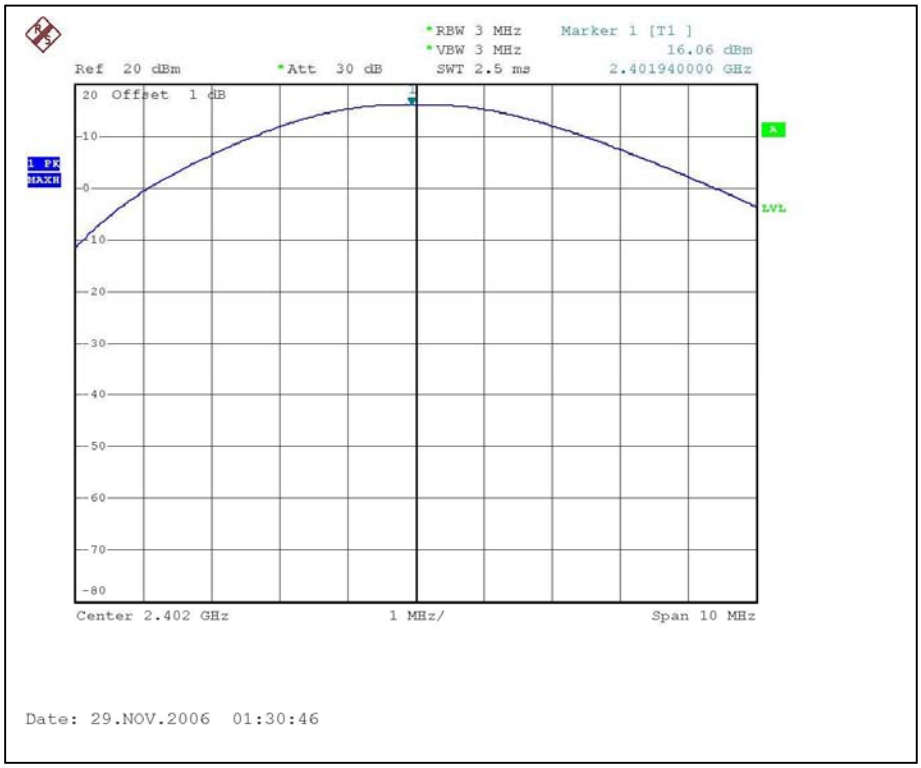
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

## 4.6.7 TEST RESULTS

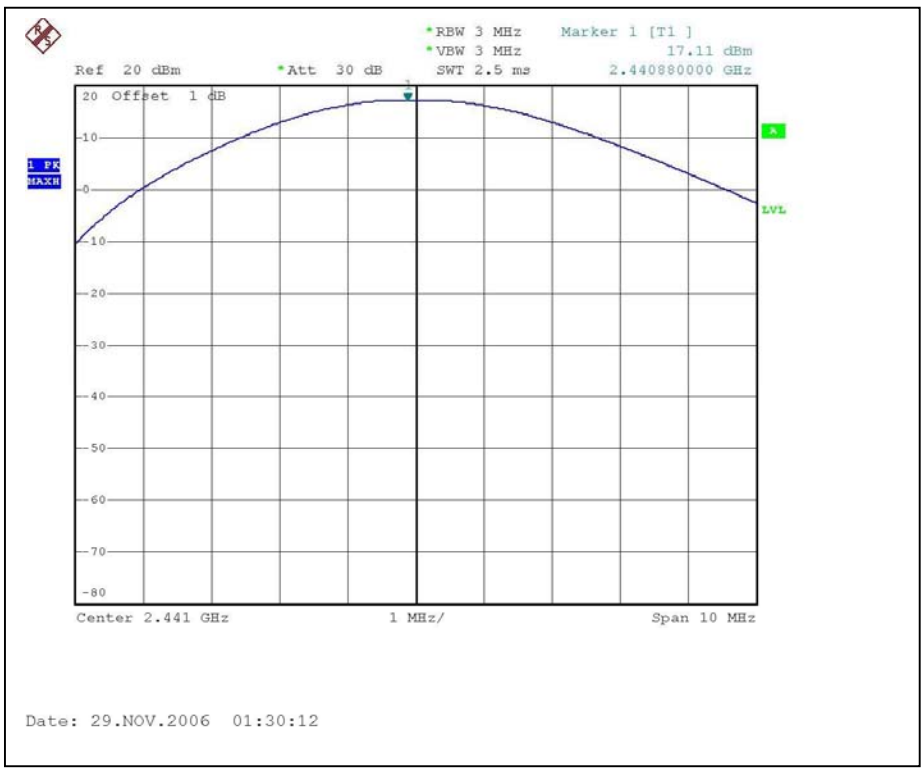
| ENVIRONMENTAL CONDITIONS | 20deg. C, 60%RH, 960 hPa | INPUT POWER (SYSTEM) | 120Vac, 60 Hz |
|---|---|---|---|
| TESTED BY | Sky Liao | | |

| CHANNEL | CHANNEL FREQUENCY (MHz) | PEAK POWER OUTPUT (mW) | PEAK POWER OUTPUT (dBm) | PEAK POWER LIMIT (mW) | PASS/FAIL |
|---|---|---|---|---|---|
| 0 | 2402 | 40.365 | 16.06 | 125 | PASS |
| 39 | 2441 | 51.404 | 17.11 | 125 | PASS |
| 78 | 2480 | 41.879 | 16.22 | 125 | PASS |

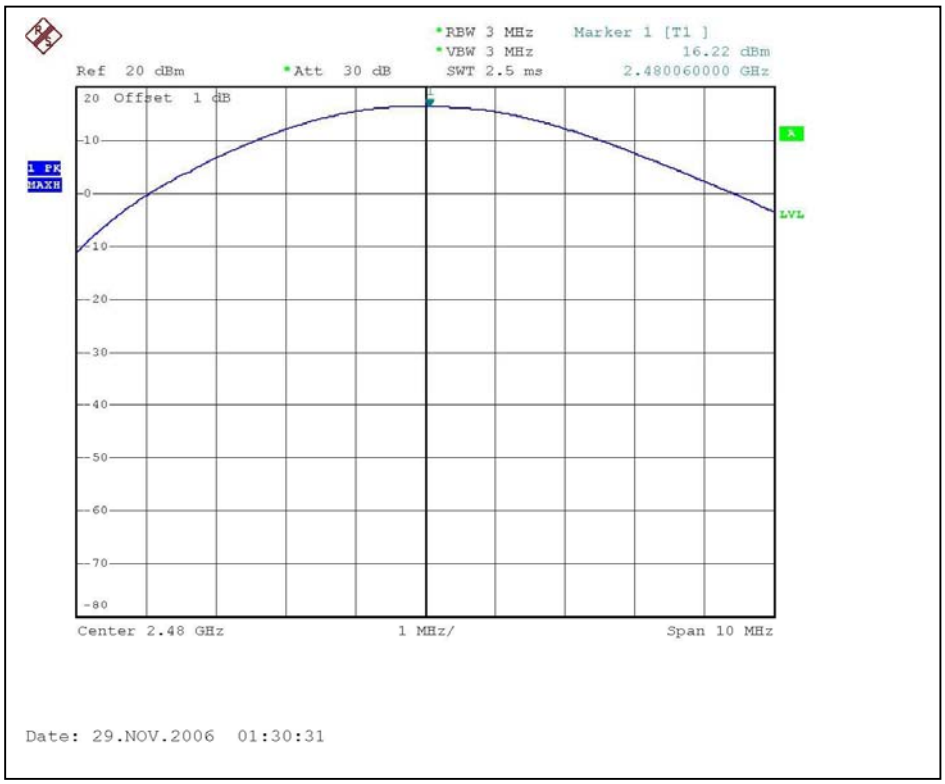
## Channel 0




## Channel 39



## Channel 78


*RBW 3 MHz
*VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1 ]
16.22 dBm
2.480060000 GHz
Ref 20 dBm
*Att 30 dB
20 Offset 1 dB
1 PK
MAXH
A
LVL
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.48 GHz
1 MHz/
Span 10 MHz
Date: 29.NOV.2006 01:30:31

## 4.7 RADIATED EMISSION MEASUREMENT

### 4.7.1 LIMITS OF RADIATED EMISSION MEASUREMENT

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

| 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 |

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.

## 4.7.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED UNTIL |
|---|---|---|---|
| ADVANTEST Spectrum Analyzer | R3271A | 85060311 | July 03, 2007 |
| HP Pre_Amplifier | 8449B | 3008A01922 | Sep. 18, 2007 |
| ROHDE & SCHWARZ Test Receiver | ESCS30 | 100375 | Sep. 20, 2007 |
| CHASE Broadband Antenna | VULB9168 | 138 | Dec. 11, 2006 |
| Schwarzbeck Horn_Antenna | BBHA9120 | D124 | Dec. 27, 2006 |
| Schwarzbeck Horn_Antenna | BBHA 9170 | BBHA9170153 | Jan. 05, 2007 |
| SCHWARZBECK Biconical Antenna | VHBA9123 | 459 | Jun. 08, 2009 |
| SCHWARZBECK Periodic Antenna | UPA6108 | 1148 | Jun. 08, 2009 |
| R&S Loop Antenna | HFH2-Z2 | 881058/15 | Nov. 29, 2007 |
| RF Switches (ARNITSU) | CS-201 | 1565157 | NA |
| RF CABLE (Chaintek) | SF102 | 22054-2 | Nov. 14. 2007 |
| RF Cable(RICHTEC) | 9913-30M N-N Cable | STCCAB-30M-1 GHz | Jul. 15, 2007 |
| Software | ADT_Radiated_V 5.14 | NA | NA |
| CHANCE MOST Antenna Tower | AT-100 | 0203 | NA |
| CHANCE MOST Turn Table | TT-100 | 0203 | NA |

Note: 1. The calibration interval of the above test instruments is 12 months (36 months for Biconical and Periodic Antenna)and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna, HP preamplifier (model: 8449B) and Spectrum Analyzer (model: R3271A) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in ADT Open Site No. C.
4. The FCC Site Registration No. is 656396.
5. The VCCI Site Registration No. is R-1626.
6. The CANADA Site Registration No. is IC 4824A-3.
7. The following table is for the measurement uncertainty, which is calculated as per the document CISPR 16-4. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

| Measurement | Value |
|---|---|
| Radiated emissions (30MHz-1GHz) | 2.98 dB |
| Radiated emissions (1GHz ~18GHz) | 2.21 dB |
| Radiated emissions (18GHz ~40GHz) | 1.88 dB |

### 4.7.3 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 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 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

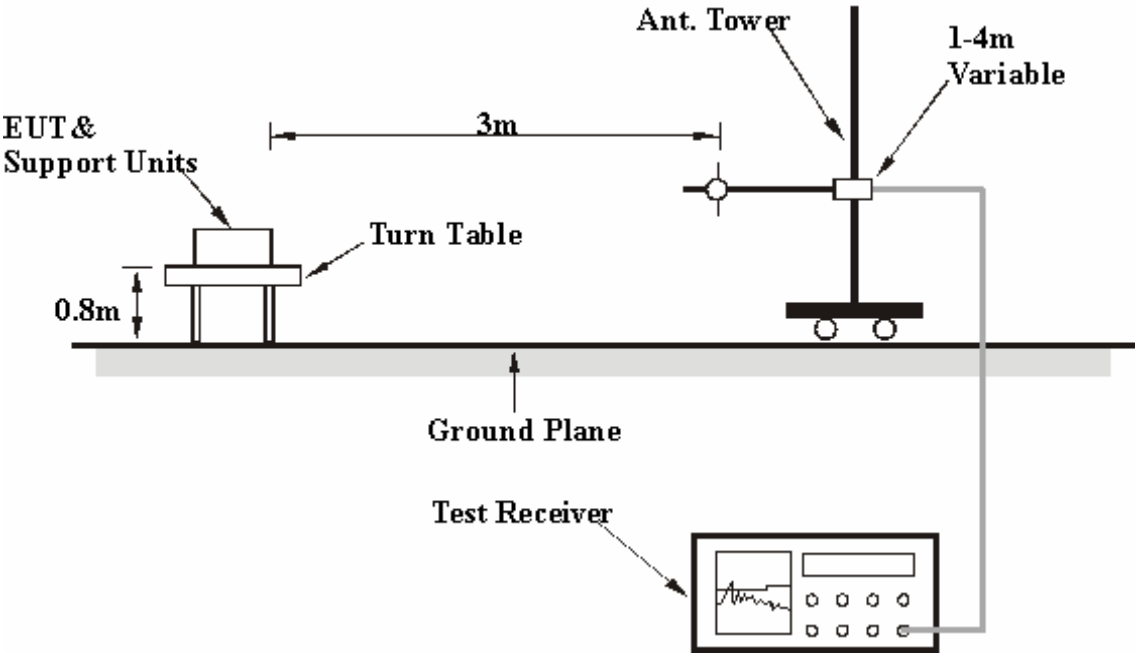
**NOTE:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.

### 4.7.4 DEVIATION FROM TEST STANDARD

No deviation

## 4.7.5 TEST SETUP




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

## 4.7.6 TEST RESULTS

| CHANNEL | 78 | FREQUENCY RANGE | Below 1GHz |
|---|---|---|---|
| INPUT POWER (SYSTEM) | 120Vac, 60 Hz | DETECTOR FUNCTION | Quasi-Peak |
| ENVIRONMENTAL CONDITIONS | 27 deg. C, 59%RH, 960 hPa | TESTED BY | Tony Chen |

**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 | 154.84 | 26.20 QP | 43.50 | -17.30 | 2.11 H | 229 | 14.80 | 11.50 |
| 2 | 265.43 | 36.10 QP | 46.00 | -9.90 | 1.16 H | 5 | 21.00 | 15.10 |
| 3 | 287.55 | 30.30 QP | 46.00 | -15.70 | 1.00 H | 21 | 14.60 | 15.70 |
| 4 | 309.68 | 36.50 QP | 46.00 | -9.50 | 1.07 H | 20 | 20.40 | 16.10 |
| 5 | 331.79 | 30.30 QP | 46.00 | -15.70 | 1.18 H | 212 | 13.80 | 16.50 |
| 6 | 420.27 | 26.80 QP | 46.00 | -19.20 | 1.00 H | 206 | 7.90 | 18.90 |
| 7 | 508.75 | 30.90 QP | 46.00 | -15.10 | 1.81 H | 359 | 10.30 | 20.60 |

**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 | 221.20 | 28.30 QP | 46.00 | -17.70 | 1.00 V | 11 | 16.00 | 12.30 |
| 2 | 228.84 | 32.10 QP | 46.00 | -13.90 | 1.11 V | 238 | 19.40 | 12.70 |
| 3 | 250.00 | 34.70 QP | 46.00 | -11.30 | 1.06 V | 62 | 20.90 | 13.80 |
| 4 | 265.44 | 25.90 QP | 46.00 | -20.10 | 1.00 V | 114 | 10.80 | 15.10 |
| 5 | 500.01 | 40.90 QP | 46.00 | -5.10 | 1.03 V | 28 | 20.50 | 20.40 |
| 6 | 633.08 | 30.40 QP | 46.00 | -15.60 | 1.05 V | 347 | 7.80 | 22.60 |
| 7 | 799.30 | 30.20 QP | 46.00 | -15.80 | 1.00 V | 247 | 5.50 | 24.60 |

**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.

| | | | |
|---|---|---|---|
| **CHANNEL** | Channel 0 | **FREQUENCY RANGE** | 1 ~25GHz |
| **INPUT POWER (SYSTEM)** | 120Vac, 60 Hz | **DETECTOR FUNCTION** | Peak(PK)<br>Average (AV) |
| **ENVIRONMENTAL CONDITIONS** | 23 deg. C, 60%RH, 960 hPa | **TESTED BY** | Moris Lin |

**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 | 47.30 PK | 74.00 | -26.70 | 1.34 H | 18 | 15.40 | 31.90 |
| 1 | 2390.00 | 17.30 AV | 54.00 | -36.70 | 1.34 H | 18 | -14.60 | 31.90 |
| 2 | *2402.00 | 107.10 PK | | | 1.34 H | 18 | 75.10 | 32.00 |
| 2 | *2402.00 | 77.10 AV | | | 1.34 H | 18 | 45.10 | 32.00 |
| 3 | 3206.00 | 54.10 PK | 74.00 | -19.90 | 1.58 H | 213 | 20.90 | 33.20 |
| 3 | 3206.00 | 24.10 AV | 54.00 | -29.90 | 1.58 H | 213 | -9.10 | 33.20 |
| 4 | 4804.00 | 52.00 PK | 74.00 | -22.00 | 1.55 H | 303 | 16.10 | 35.90 |
| 4 | 4804.00 | 22.00 AV | 54.00 | -32.00 | 1.55 H | 303 | -13.90 | 35.90 |
| 5 | 7206.00 | 66.20 PK | 74.00 | -7.80 | 1.31 H | 120 | 24.00 | 42.10 |
| 5 | 7206.00 | 36.20 AV | 54.00 | -17.80 | 1.31 H | 120 | -6.00 | 42.10 |
| 6 | 12010.00 | 67.10 PK | 74.00 | -6.90 | 1.65 H | 12 | 20.60 | 46.50 |
| 6 | 12010.00 | 37.10 AV | 54.00 | -16.90 | 1.65 H | 12 | -9.40 | 46.50 |

**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 | 56.70 PK | 74.00 | -17.30 | 1.36 V | 263 | 24.70 | 31.90 |
| 1 | 2390.00 | 26.70 AV | 54.00 | -27.30 | 1.36 V | 263 | -5.30 | 31.90 |
| 2 | *2402.00 | 116.50 PK | | | 1.36 V | 263 | 84.50 | 32.00 |
| 2 | *2402.00 | 86.50 AV | | | 1.36 V | 263 | 54.50 | 32.00 |
| 3 | 3206.00 | 56.00 PK | 74.00 | -18.00 | 1.42 V | 335 | 22.80 | 33.20 |
| 3 | 3206.00 | 26.00 AV | 54.00 | -28.00 | 1.42 V | 335 | -7.20 | 33.20 |
| 4 | 4804.00 | 56.80 PK | 74.00 | -17.20 | 1.32 V | 159 | 20.80 | 35.90 |
| 4 | 4804.00 | 26.80 AV | 54.00 | -27.20 | 1.32 V | 159 | -9.20 | 35.90 |
| 5 | 7206.00 | 70.80 PK | 74.00 | -3.20 | 1.03 V | 3 | 28.70 | 42.10 |
| 5 | 7206.00 | 40.80 AV | 54.00 | -13.20 | 1.03 V | 3 | -1.30 | 42.10 |
| **6** | **12010.00** | **72.90 PK** | **74.00** | **-1.10** | **1.17 V** | **275** | **26.50** | **46.50** |
| 6 | 12010.00 | 42.90 AV | 54.00 | -11.10 | 1.17 V | 275 | -3.50 | 46.50 |

**REMARKS**:
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB)
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 DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon Bluetooth theory the transmitter is on 0.625*5 per 296.25 ms per channel.Therefore, the duty cycle be equal to: 20log(3.125/100)= -30dB
7. Average value = peak reading +20log(duty cycle)

| | | | |
|---|---|---|---|
| **CHANNEL** | Channel 39 | **FREQUENCY RANGE** | 1 ~25GHz |
| **INPUT POWER (SYSTEM)** | 120Vac, 60 Hz | **DETECTOR FUNCTION** | Peak(PK)<br>Average (AV) |
| **ENVIRONMENTAL CONDITIONS** | 23 deg. C, 60%RH, 960 hPa | **TESTED BY** | Moris Lin |

**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 | *2441.00 | 108.20 PK | | | 1.33 H | 20 | 76.10 | 32.10 |
| 1 | *2441.00 | 78.20 AV | | | 1.33 H | 20 | 46.10 | 32.10 |
| 2 | 3254.00 | 52.80 PK | 74.00 | -21.20 | 1.58 H | 211 | 19.60 | 33.30 |
| 2 | 3254.00 | 22.80 AV | 54.00 | -31.20 | 1.58 H | 211 | -10.40 | 33.30 |
| 3 | 4882.00 | 51.90 PK | 74.00 | -22.10 | 1.58 H | 312 | 15.80 | 36.10 |
| 3 | 4882.00 | 31.90 AV | 54.00 | -22.10 | 1.58 H | 312 | -4.20 | 36.10 |
| 4 | 7323.00 | 67.00 PK | 74.00 | -7.00 | 1.30 H | 129 | 24.40 | 42.60 |
| 4 | 7323.00 | 37.00 AV | 54.00 | -17.00 | 1.30 H | 129 | -5.60 | 42.60 |
| 5 | 12205.00 | 64.20 PK | 74.00 | -9.80 | 1.65 H | 8 | 17.80 | 46.40 |
| 5 | 12205.00 | 34.20 AV | 54.00 | -19.80 | 1.65 H | 8 | -12.20 | 46.40 |

**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 | *2441.00 | 117.30 PK | | | 1.38 V | 258 | 85.20 | 32.10 |
| 1 | *2441.00 | 87.30 AV | | | 1.38 V | 258 | 55.20 | 32.10 |
| 2 | 3254.00 | 54.80 PK | 74.00 | -19.20 | 1.41 V | 336 | 21.60 | 33.30 |
| 2 | 3254.00 | 24.80 AV | 54.00 | -29.20 | 1.41 V | 336 | -8.40 | 33.30 |
| 3 | 4882.00 | 56.60 PK | 74.00 | -17.40 | 1.33 V | 162 | 20.50 | 36.10 |
| 3 | 4882.00 | 26.60 AV | 54.00 | -27.40 | 1.33 V | 162 | -9.50 | 36.10 |
| 4 | 7323.00 | 70.70 PK | 74.00 | -3.30 | 1.05 V | 9 | 28.10 | 42.60 |
| 4 | 7323.00 | 40.70 AV | 54.00 | -13.30 | 1.05 V | 9 | -1.90 | 42.60 |
| 5 | 12205.00 | 69.90 PK | 74.00 | -4.10 | 1.18 V | 283 | 23.50 | 46.40 |
| 5 | 12205.00 | 39.90 AV | 54.00 | -14.10 | 1.18 V | 283 | -6.50 | 46.40 |

**REMARKS**:
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB)
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 DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon Bluetooth theory the transmitter is on 0.625*5 per 296.25 ms per channel.Therefore, the duty cycle be equal to: 20log(3.125/100)= -30dB
7. Average value = peak reading +20log(duty cycle)

| | | | |
|---|---|---|---|
| **CHANNEL** | Channel 78 | **FREQUENCY RANGE** | 1 ~25GHz |
| **INPUT POWER (SYSTEM)** | 120Vac, 60 Hz | **DETECTOR FUNCTION** | Peak(PK)<br>Average (AV) |
| **ENVIRONMENTAL CONDITIONS** | 23 deg. C, 60%RH, 960 hPa | **TESTED BY** | Moris Lin |

**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 | 108.40 PK | | | 1.31 H | 16 | 76.10 | 32.30 |
| 1 | *2480.00 | 78.40 AV | | | 1.31 H | 16 | 46.10 | 32.30 |
| 2 | 2483.50 | 63.10 PK | 74.00 | -10.90 | 1.31 H | 16 | 30.80 | 32.30 |
| 2 | 2483.50 | 33.10 AV | 54.00 | -20.90 | 1.31 H | 16 | 0.80 | 32.30 |
| 3 | 3308.00 | 50.80 PK | 74.00 | -23.20 | 1.56 H | 208 | 17.60 | 33.30 |
| 3 | 3308.00 | 20.80 AV | 54.00 | -33.20 | 1.56 H | 208 | -12.40 | 33.30 |
| 4 | 4960.00 | 51.80 PK | 74.00 | -22.20 | 1.56 H | 298 | 15.60 | 36.30 |
| 4 | 4960.00 | 21.80 AV | 54.00 | -32.20 | 1.56 H | 298 | -14.40 | 36.30 |
| 5 | 7440.00 | 67.80 PK | 74.00 | -6.20 | 1.29 H | 115 | 24.80 | 43.00 |
| 5 | 7440.00 | 37.80 AV | 54.00 | -16.20 | 1.29 H | 115 | -5.20 | 43.00 |
| 6 | 12400.00 | 61.10 PK | 74.00 | -12.90 | 1.67 H | 7 | 14.80 | 46.30 |
| 6 | 12400.00 | 31.10 AV | 54.00 | -22.90 | 1.67 H | 7 | -15.20 | 46.30 |

**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 | 117.40 PK | | | 1.37 V | 261 | 85.10 | 32.30 |
| 1 | *2480.00 | 87.40 AV | | | 1.37 V | 261 | 55.10 | 32.30 |
| 2 | 2483.50 | 72.10 PK | 74.00 | -1.90 | 1.37 V | 261 | 39.80 | 32.30 |
| 2 | 2483.50 | 42.10 AV | 54.00 | -11.90 | 1.37 V | 261 | 9.80 | 32.30 |
| 3 | 3308.00 | 52.80 PK | 74.00 | -21.20 | 1.40 V | 340 | 19.60 | 33.30 |
| 3 | 3308.00 | 22.70 AV | 54.00 | -31.30 | 1.40 V | 340 | -10.50 | 33.30 |
| 4 | 4960.00 | 56.60 PK | 74.00 | -17.40 | 1.27 V | 155 | 20.30 | 36.30 |
| 4 | 4960.00 | 26.60 AV | 54.00 | -27.40 | 1.27 V | 155 | -9.70 | 36.30 |
| 5 | 7440.00 | 70.60 PK | 74.00 | -3.40 | 1.55 V | 99 | 27.60 | 43.00 |
| 5 | 7440.00 | 40.60 AV | 54.00 | -13.40 | 1.55 V | 99 | -2.40 | 43.00 |
| 6 | 12400.00 | 67.90 PK | 74.00 | -6.10 | 1.18 V | 278 | 21.60 | 46.30 |
| 6 | 12400.00 | 37.90 AV | 54.00 | -16.10 | 1.18 V | 278 | -8.40 | 46.30 |

**REMARKS**:
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB)
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 DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon Bluetooth theory the transmitter is on 0.625*5 per 296.25 ms per channel.Therefore, the duty cycle be equal to: 20log(3.125/100)= -30dB
7. Average value = peak reading +20log(duty cycle)

## 4.8 BAND EDGES MEASUREMENT

### 4.8.1 LIMITS OF BAND EDGES MEASUREMENT

Below –20dB of the highest emission level of operating band (in 100KHz RBW).

### 4.8.2 TEST INSTRUMENTS

| Description & Manufacturer | Model No. | Serial No. | Calibrated Until |
|---|---|---|---|
| R&S SPECTRUM ANALYZER | FSP40 | 100036 | Dec. 09, 2006 |

**Note:**

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 4.8.3 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 with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

### 4.8.4 DEVIATION FROM TEST STANDARD

No deviation

### 4.8.5 EUT OPERATING CONDITION

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

### 4.8.6 TEST RESULTS

The spectrum plots are attached on the following 2 pages. D2 line indicates the highest level, D1 line indicates the 20dB offset below D2. It shows compliance with the requirement in part 15.247(C).

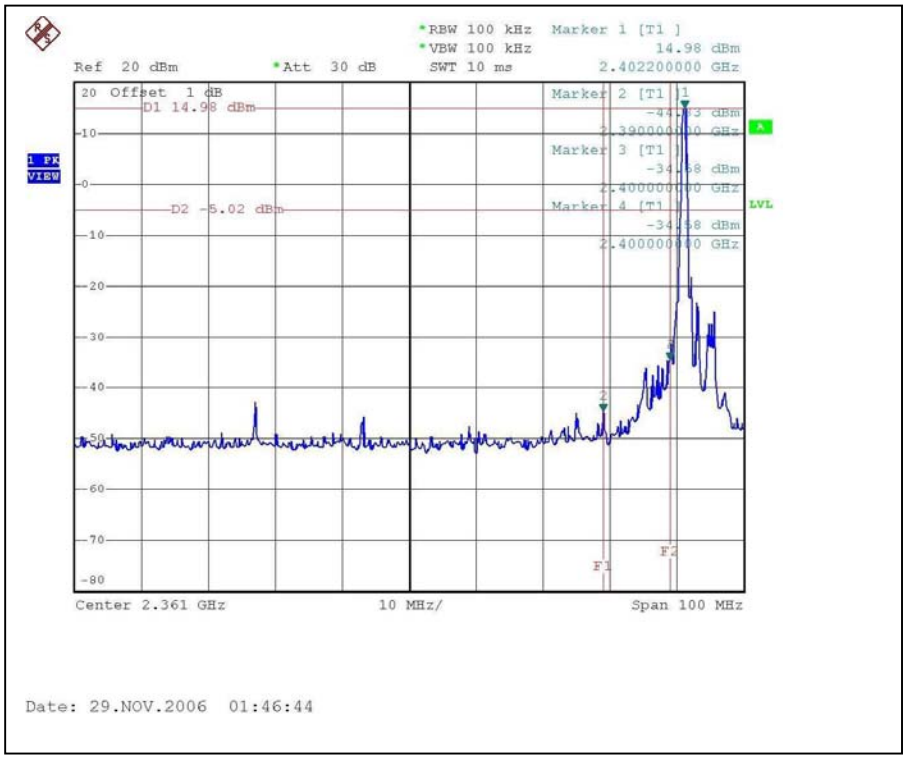
Note - The delta method is only used up to 2 MHz away from the restricted bandage, The radiated emissions which located in other restricted frequency band, the result, please refer to 4.2.

**NOTE (Peak):**
The band edge emission plot on the following page show 59.76dB delta between carrier maximum power and local maximum emission in restrict band (2.3900GHz). The emission of carrier strength list in the test result of channel 0 at the item 4.2 is 116.50dBuV/m, so the maximum field strength in restrict band is 116.50-59.76=56.74dBuV/m which is under 74 dBuV/m limit.

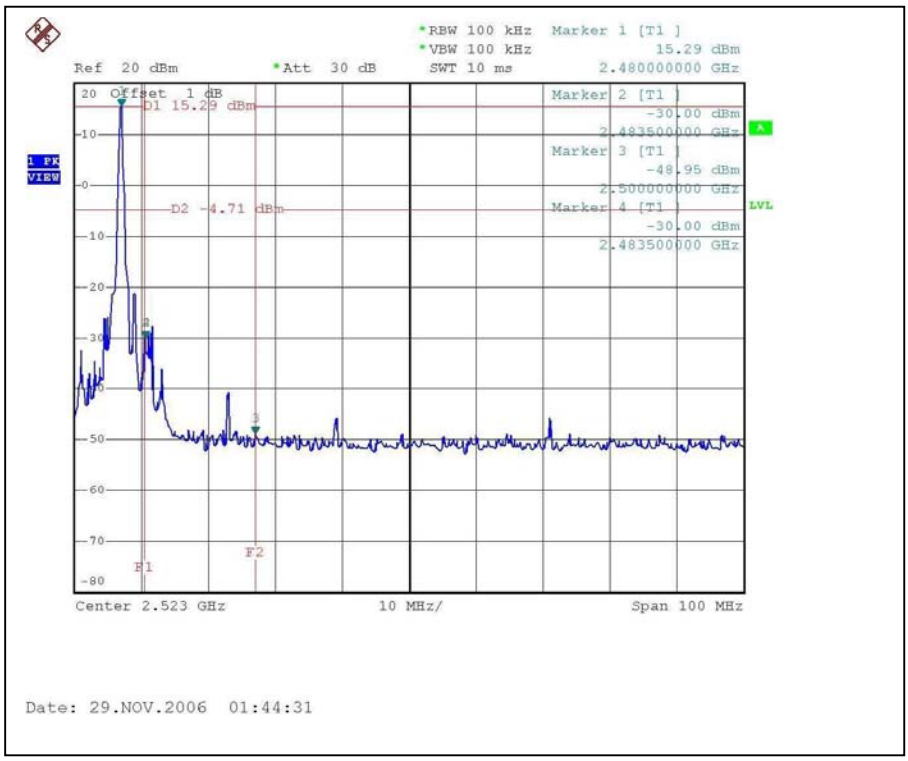
The band edge emission plot on the following page shows 45.29dB delta between carrier maximum power and local maximum emission in restrict band (2.4835GHz). The emission of carrier strength list in the test result of channel 78 at the item 4.2 is 117.40dBuV/m, so the maximum field strength in restrict band is 117.40-45.29=72.11dBuV/m which is under 74 dBuV/m limit.

**NOTE (Average):**
Average value = 56.74-30.00=26.74dBuV/m, which is under 54dBuV/m limit.
*The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon Bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle be equal to: 20log(3.125/100)= -30 dB. Average value = peak reading – 30.00.

Average value = 72.11-30.00=42.11dBuV/m, which is under 54dBuV/m limit.
*The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon Bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle be equal to: 20log(3.125/100)= -30 dB. Average value = peak reading – 30.00.




Date: 29.NOV.2006 01:46:44




Date: 29.NOV.2006 01:44:31

## 4.9 ANTENNA REQUIREMENT

### 4.9.1 STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.
And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 4.9.2 ANTENNA CONNECTED CONSTRUCTION

The antenna used in this product is Dipole antenna with I-PEX connector. The maximum Gain of the antenna is 2dBi

# 5 PHOTOGRAPHS OF THE TEST CONFIGURATION

CONDUCTED EMISSION TEST (Mode 1)


CONDUCTED EMISSION TEST (Mode 2)


RADIATED EMISSION TEST


# 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:

| | |
|---|---|
| **USA** | FCC, UL, A2LA |
| **Germany** | TUV Rheinland |
| **Japan** | VCCI |
| **Norway** | NEMKO |
| **Canada** | INDUSTRY CANADA, CSA |
| **R.O.C.** | CNLA, BSMI, NCC |
| **Netherlands** | Telefication |
| **Singapore** | PSB, GOST-ASIA (MOU) |
| **Russia** | 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.
If you have any comments, please feel free to contact us at the following:


**Linko EMC/RF Lab**:
Tel: 886-2-26052180
Fax: 886-2-26052943

**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

**Email**: service@adt.com.tw
**Web Site**: www.adt.com.tw


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