# FCC TEST REPORT

**REPORT NO.:** RF980708L01
**MODEL NO.:** HDR170 (refer to item 3.1 for more detail)
**RECEIVED:** Jul. 09, 2009
**TESTED:** Jul. 13 ~ Jul. 29, 2009
**ISSUED:** Aug. 24, 2009

**APPLICANT:** Sennheiser electronic GmbH & Co.KG

**ADDRESS:** Am Labor 1, D-30900 Wedemark Postfach 100 264, D-30892 Wedemark, Germany

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

**LAB ADDRESS:** No. 47, 14th Ling, Chia Pau Tsuen, Lin Kou Hsiang, Taipei Hsien 244, Taiwan, R.O.C.

**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:** Digital Wireless Headphone System (RS170/180)

**MODEL:** HDR170 (refer to item 3.1 for more detail)

**BRAND:** SENNHEISER

**APPLICANT:** Sennheiser electronic GmbH & Co.KG

**TESTED:** Jul. 13 ~ Jul. 29, 2009

**TEST SAMPLE:** MASS-PRODUCTION

**STANDARDS:** **FCC Part 15, Subpart C (Section 15.247)**
ANSI C63.4-2003

The above equipment (model: HDR170, HDR180) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch,** and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

| | | | |
|---|---|---|---|
| **PREPARED BY** | : Polly Chien<br>Polly Chien / Specialist | **, DATE :** | Aug. 24, 2009 |
| **TECHNICAL ACCEPTANCE**<br>Responsible for RF | : Long Chen<br>Long Chen / Senior Engineer | **, DATE :** | Aug. 24, 2009 |
| **APPROVED BY** | : Gary Chang<br>Gary Chang / Assistant Manager | **, DATE :** | Aug. 24, 2009 |

## 2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC Part 15, Subpart C | | | |
|---|---|---|---|
| **Standard Section** | **Test Type and Limit** | **Result** | **Remark** |
| 15.207 | AC Power Conducted Emission | NA | Power supply is 2.4Vdc from battery. |
| 15.247(a)(2) | Spectrum Bandwidth of a Direct Sequence Spread Spectrum System Limit: min. 500kHz | PASS | Meet the requirement of limit. |
| 15.247(b) | Maximum Peak Output Power Limit: max. 30dBm | PASS | Meet the requirement of limit. |
| 15.247(d) | Radiated Emissions Limit: Table 15.209 | PASS | Meet the requirement of limit. Minimum passing margin is -6.73dB at 12015.00MHz. |
| 15.247(e) | Power Spectral Density Limit: max. 8dBm | PASS | Meet the requirement of limit. |
| 15.247(d) | Band Edge Measurement Limit: 20dB less than the peak value of fundamental frequency | PASS | Meet the requirement of limit. |

### 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 | 150kHz~30MHz | 2.44 dB |
| Radiated emissions | 30MHz ~ 200MHz | 3.19 dB |
| | 200MHz ~1000MHz | 3.21 dB |
| | 1GHz ~ 18GHz | 2.26 dB |
| | 18GHz ~ 40GHz | 1.94 dB |

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

# 3. GENERAL INFORMATION

## 3.1 GENERAL DESCRIPTION OF EUT

| | |
|---|---|
| **PRODUCT** | Digital Wireless Headphone System (RS170/180) |
| **MODEL NO.** | HDR170 (refer to note 1 as below) |
| **FCC ID** | DMOHDR180 |
| **POWER SUPPLY** | 2.4Vdc from battery |
| **MODULATION TYPE** | MSK |
| **TRANSFER RATE** | 2.37Mb/s |
| **OPRTAING FREQUENCY** | 2403MHz ~ 2473MHz |
| **NUMBER OF CHANNEL** | 15 |
| **MAXIMUM OUTPUT POWER** | 7.69mW |
| **ANTENNA TYPE** | Refer to NOTE 2 for more details |
| **DATA CABLE** | NA |
| **I/O PORTS** | NA |
| **ACCESSORY DEVICES** | NA |

**NOTE:**

1. The following models are provided to this EUT.

| BRAND | MODEL | DESCRIPTION |
|---|---|---|
| SENNHEISER | HDR170 | 1. With 3D base (Audio function different)<br>2. Color : Black<br>3. Same PCB |
| SENNHEISER | HDR180 | 1. With balance L/R (Audio function different)<br>2. Color : Grey<br>3. Same PCB |

2. The antennas used in this EUT are listed as below table:

| NO. | TYPE | CONNECTOR | GAIN (dBi) |
|---|---|---|---|
| 1 | Inverted F | NA | 4.65 |
| 2 | Inverted F | NA | 3.67 |

* Antenna 1 was chosen for final test.

3. 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.

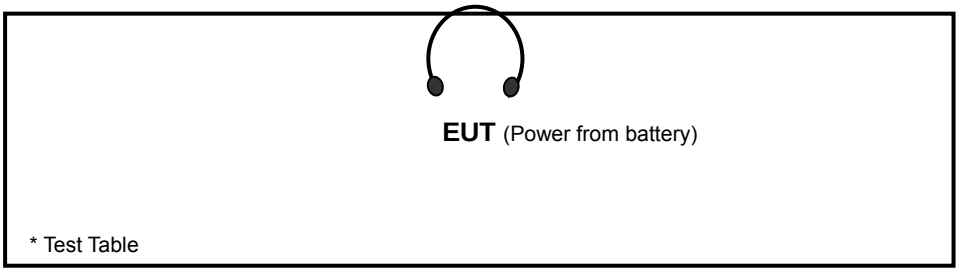
## 3.2 DESCRIPTION OF TEST MODES

15 channels are provided to this EUT

| CHANNEL | FREQUENCY | CHANNEL | FREQUENCY |
|---|---|---|---|
| 0 | 2403 MHz | 8 | 2443 MHz |
| 1 | 2408 MHz | 9 | 2448 MHz |
| 2 | 2413 MHz | 10 | 2453 MHz |
| 3 | 2418 MHz | 11 | 2458 MHz |
| 4 | 2423 MHz | 12 | 2463 MHz |
| 5 | 2428 MHz | 13 | 2468 MHz |
| 6 | 2433 MHz | 14 | 2473 MHz |
| 7 | 2438 MHz | | |

### 3.2.1 CONFIGURATION OF SYSTEM UNDER TEST

**TEST MODE A, B**



## 3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

| EUT CONFIGURE MODE | APPLICABLE TO | | | | DESCRIPTION |
|---|---|---|---|---|---|
| | RE≥1G | RE<1G | PLC | APCM | |
| A | - | √ | NOTE 1 | - | Model: HDR170 |
| B | √ | √ | NOTE 1 | √ | Model: HDR180 |

Where **PLC:** Power Line Conducted Emission **RE<1G:** Radiated Emission below 1GHz
**RE≥1G:** Radiated Emission above 1GHz **APCM:** Antenna Port Conducted Measurement

**NOTE 1:** No need to concern of Conducted Emission due to the EUT is powered by battery.

**NOTE 2:** "-" 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, data rates, XYZ axis and antenna ports (if EUT with antenna diversity architecture).

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

| EUT CONFIGURE MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE | AXIS |
|---|---|---|---|---|
| B | 0 to 14 | 0, 7, 14 | MSK | Y |

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

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports (if EUT with antenna diversity architecture).

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

| EUT CONFIGURE MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE | AXIS |
|---|---|---|---|---|
| A, B | 0 to 14 | 0 | MSK | Y |

**BANDEDGE MEASUREMENT:**

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, and antenna ports (if EUT with antenna diversity architecture).

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

| EUT CONFIGURE MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|---|---|---|---|
| B | 0 to 14 | 0, 14 | MSK |

**ANTENNA PORT CONDUCTED MEASUREMENT:**

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, and antenna ports (if EUT with antenna diversity architecture).

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

| EUT CONFIGURE MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|---|---|---|---|
| B | 0 to 14 | 0, 7, 14 | MSK |

## 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 (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.

## 3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit.

# 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 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 |

**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. | DATE OF CALIBRATION | DUE DATE OF CALIBRATION |
|---|---|---|---|---|
| Test Receiver ROHDE & SCHWARZ | ESI7 | 838496/016 | Dec. 29, 2008 | Dec. 28, 2009 |
| Spectrum Analyzer ROHDE & SCHWARZ | FSP40 | 100039 | Dec. 08, 2008 | Dec. 07, 2009 |
| BILOG Antenna SCHWARZBECK | VULB9168 | 9168-155 | Apr. 29, 2009 | Apr. 28, 2010 |
| HORN Antenna SCHWARZBECK | BBHA 9120D | 9120D-408 | Dec. 29, 2008 | Dec. 28, 2009 |
| HORN Antenna SCHWARZBECK | BBHA 9170 | BBHA9170242 | Jan. 06, 2009 | Jan. 05, 2010 |
| Preamplifier Agilent | 8449B | 3008A01960 | Nov. 03, 2008 | Nov. 02, 2009 |
| Preamplifier Agilent | 8447D | 2944A10631 | Nov. 03, 2008 | Nov. 02, 2009 |
| RF signal cable HUBER+SUHNNER | SUCOFLEX 104 | 274041/4 | Aug. 21, 2008 | Aug. 20, 2009 |
| RF signal cable HUBER+SUHNNER | SUCOFLEX 104 | 283397/4 | Aug. 21, 2008 | Aug. 20, 2009 |
| Software ADT. | ADT_Radiated_ V7.6.15.9.2 | NA | NA | NA |
| Antenna Tower inn-co GmbH | MA 4000 | 010303 | NA | NA |
| Antenna Tower Controller inn-co GmbH | CO2000 | 019303 | NA | NA |
| Turn Table ADT. | TT100. | TT93021704 | NA | NA |
| Turn Table Controller ADT. | SC100. | SC93021704 | NA | NA |

**NOTE:**
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 4.
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 IC7450F-4.

### 4.1.3 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters 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.

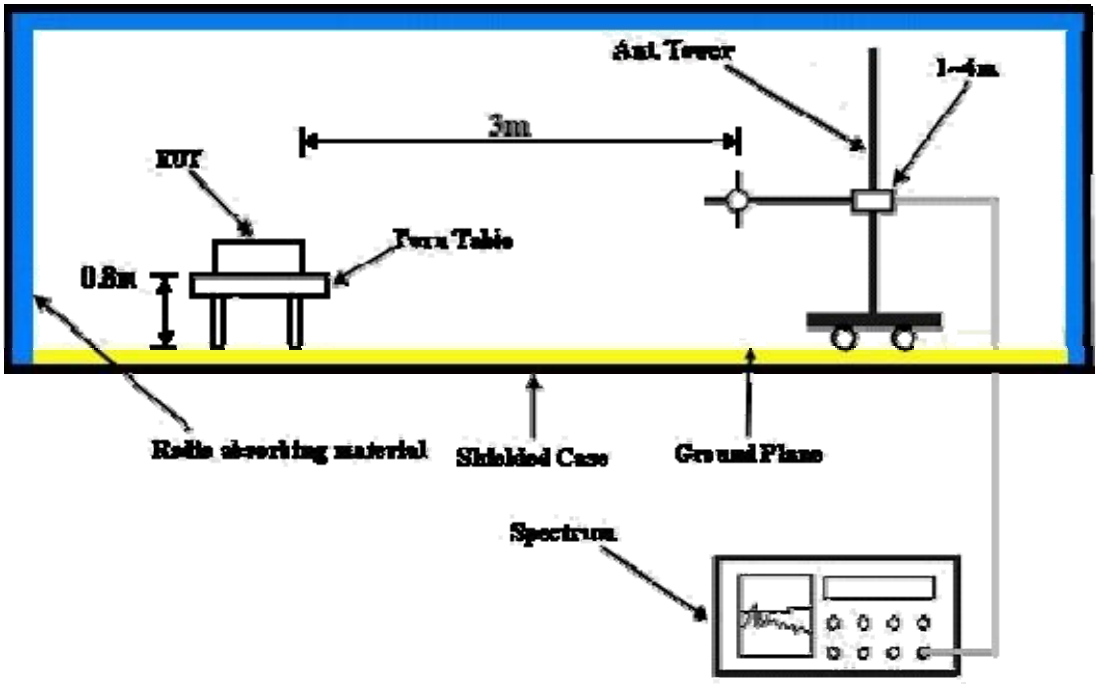
**NOTE:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

### 4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

### 4.1.5 TEST SETUP




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

### 4.1.6 EUT OPERATING CONDITIONS

a. Placed the EUT on the testing table.
b. Set the EUT under transmitting function.

## 4.1.7 TEST RESULTS

**ABOVE 1GHz DATA**

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|---|---|---|---|
| CHANNEL | Channel 0 | FREQUENCY RANGE | 1 ~ 25GHz |
| INPUT POWER (SYSTEM) | 120Vac, 60 Hz | DETECTOR FUNCTION | Peak (PK)<br>Average (AV) |
| ENVIRONMENTAL CONDITIONS | 24deg. C, 64%RH<br>1000 hPa | TESTED BY | Dean Wang |
| TEST MODE | B | | |

| 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 | 57.89 PK | 74.00 | -16.11 | 1.28 H | 292 | 27.14 | 30.75 |
| 2 | 2390.00 | 47.25 AV | 54.00 | -6.75 | 1.28 H | 292 | 16.50 | 30.75 |
| 3 | #2400.00 | 81.03 PK | 89.32 | -8.29 | 1.27 H | 291 | 50.24 | 30.79 |
| 4 | #2400.00 | 42.97 AV | 51.02 | -8.05 | 1.27 H | 291 | 12.18 | 30.79 |
| 5 | *2403.00 | 109.32 PK | | | 1.27 H | 291 | 78.52 | 30.80 |
| 6 | *2403.00 | 71.02 AV | | | 1.27 H | 291 | 40.22 | 30.80 |
| 7 | 4806.00 | 53.30 PK | 74.00 | -20.70 | 1.48 H | 58 | 16.67 | 36.63 |
| 8 | 4806.00 | 6.04 AV | 54.00 | -47.96 | 1.48 H | 58 | -30.59 | 36.63 |
| 9 | #7209.00 | 58.77 PK | 89.32 | -30.55 | 1.03 H | 326 | 16.23 | 42.55 |
| 10 | #7209.00 | 11.34 AV | 51.02 | -39.68 | 1.03 H | 326 | -31.20 | 42.55 |
| 11 | #9612.00 | 67.33 PK | 89.32 | -21.99 | 1.32 H | 344 | 20.79 | 46.54 |
| 12 | #9612.00 | 21.17 AV | 51.02 | -29.85 | 1.32 H | 344 | -25.37 | 46.54 |
| 13 | 12015.00 | 64.39 PK | 74.00 | -9.61 | 1.04 H | 138 | 17.07 | 47.32 |
| 14 | 12015.00 | 16.47 AV | 54.00 | -37.53 | 1.04 H | 138 | -30.85 | 47.32 |
| 15 | #14418.00 | 70.44 PK | 89.32 | -18.88 | 1.00 H | 137 | 19.06 | 51.38 |
| 16 | #14418.00 | 21.32 AV | 51.02 | -29.70 | 1.00 H | 137 | -30.06 | 51.38 |

**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.
5. " * " : Fundamental frequency
6. "#":The radiated frequency is out the restricted band.
7. The average value of fundamental frequency and harmonics is calculated by using formula as below

Average = Reading value of RBW=1MHz and VBW=10Hz + 20 log (duty cycle)

20 log (Duty cycle) = 20 log (1.68 ms / 100 ms) = -35.49 dB

Therefore

Average=Reading value of RBW=1MHz and VBW=10Hz -35.49 dB

Please see page 22 for plotted duty.

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|---|---|---|---|
| CHANNEL | Channel 0 | FREQUENCY RANGE | 1 ~ 25GHz |
| INPUT POWER (SYSTEM) | 120Vac, 60 Hz | DETECTOR FUNCTION | Peak (PK)<br>Average (AV) |
| ENVIRONMENTAL CONDITIONS | 24deg. C, 64%RH<br>1000 hPa | TESTED BY | Dean Wang |
| TEST MODE | B | | |

| 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 | 57.62 PK | 74.00 | -16.38 | 1.10 V | 212 | 26.87 | 30.75 |
| 2 | 2390.00 | 46.78 AV | 54.00 | -7.22 | 1.10 V | 212 | 16.03 | 30.75 |
| 3 | #2400.00 | 75.16 PK | 83.21 | -8.05 | 1.10 V | 211 | 44.37 | 30.79 |
| 4 | #2400.00 | 37.11 AV | 45.16 | -8.05 | 1.10 V | 211 | 6.32 | 30.79 |
| 5 | *2403.00 | 103.21 PK | | | 1.10 V | 211 | 72.41 | 30.80 |
| 6 | *2403.00 | 65.16 AV | | | 1.10 V | 211 | 34.36 | 30.80 |
| 7 | 4806.00 | 55.69 PK | 74.00 | -18.31 | 1.00 V | 94 | 19.06 | 36.63 |
| 8 | 4806.00 | 9.68 AV | 54.00 | -44.32 | 1.00 V | 94 | -26.95 | 36.63 |
| 9 | #7209.00 | 60.27 PK | 83.21 | -22.94 | 1.18 V | 100 | 17.73 | 42.55 |
| 10 | #7209.00 | 12.78 AV | 45.16 | -32.38 | 1.18 V | 100 | -29.76 | 42.55 |
| 11 | #9612.00 | 67.79 PK | 83.21 | -15.42 | 1.01 V | 25 | 21.25 | 46.54 |
| 12 | #9612.00 | 21.77 AV | 45.16 | -23.39 | 1.01 V | 25 | -24.77 | 46.54 |
| **13** | **12015.00** | **67.27 PK** | **74.00** | **-6.73** | **1.30 V** | **101** | **19.95** | **47.32** |
| 14 | 12015.00 | 20.49 AV | 54.00 | -33.51 | 1.30 V | 101 | -26.83 | 47.32 |
| 15 | #14418.00 | 70.93 PK | 83.21 | -12.28 | 1.43 V | 120 | 19.55 | 51.38 |
| 16 | #14418.00 | 22.94 AV | 45.16 | -22.22 | 1.43 V | 120 | -28.44 | 51.38 |

**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.
5. " * " : Fundamental frequency
6. "#":The radiated frequency is out the restricted band.
7. The average value of fundamental frequency and harmonics is calculated by using formula as below

Average = Reading value of RBW=1MHz and VBW=10Hz + 20 log (duty cycle)

20 log (Duty cycle) = 20 log (1.68 ms / 100 ms) = -35.49 dB

Therefore

Average=Reading value of RBW=1MHz and VBW=10Hz -35.49 dB
Please see page 22 for plotted duty.

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|---|---|---|---|
| CHANNEL | Channel 7 | FREQUENCY RANGE | 1 ~ 25GHz |
| INPUT POWER (SYSTEM) | 120Vac, 60 Hz | DETECTOR FUNCTION | Peak (PK)<br>Average (AV) |
| ENVIRONMENTAL CONDITIONS | 24deg. C, 64%RH<br>1000 hPa | TESTED BY | Dean Wang |
| TEST MODE | B | | |

| 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 | *2438.00 | 108.16 PK | | | 1.30 H | 259 | 77.25 | 30.91 |
| 2 | *2438.00 | 69.90 AV | | | 1.30 H | 259 | 38.99 | 30.91 |
| 3 | 4876.00 | 53.44 PK | 74.00 | -20.56 | 1.48 H | 36 | 16.72 | 36.72 |
| 4 | 4876.00 | 6.27 AV | 54.00 | -47.73 | 1.48 H | 36 | -30.45 | 36.72 |
| 5 | 7314.00 | 57.57 PK | 74.00 | -16.43 | 1.07 H | 359 | 14.83 | 42.74 |
| 6 | 7314.00 | 9.54 AV | 54.00 | -44.46 | 1.07 H | 359 | -33.20 | 42.74 |
| 7 | #9752.00 | 66.51 PK | 88.16 | -21.65 | 1.23 H | 12 | 19.84 | 46.67 |
| 8 | #9752.00 | 19.19 AV | 49.90 | -30.71 | 1.23 H | 12 | -27.48 | 46.67 |
| 9 | 12190.00 | 63.38 PK | 74.00 | -10.62 | 1.00 H | 152 | 16.28 | 47.10 |
| 10 | 12190.00 | 14.69 AV | 54.00 | -39.31 | 1.00 H | 152 | -32.41 | 47.10 |
| 11 | #14628.00 | 66.41 PK | 88.16 | -21.75 | 1.04 H | 144 | 15.12 | 51.29 |
| 12 | #14628.00 | 16.72 AV | 49.90 | -33.18 | 1.04 H | 144 | -34.57 | 51.29 |

**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.
5. " * " : Fundamental frequency
6. "#":The radiated frequency is out the restricted band.
7. The average value of fundamental frequency and harmonics is calculated by using formula as below

   Average = Reading value of RBW=1MHz and VBW=10Hz + 20 log (duty cycle)

   20 log (Duty cycle) = 20 log (1.68 ms / 100 ms) = -35.49 dB

   Therefore

   Average=Reading value of RBW=1MHz and VBW=10Hz -35.49 dB
   Please see page 22 for plotted duty.

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|---|---|---|---|
| CHANNEL | Channel 7 | FREQUENCY RANGE | 1 ~ 25GHz |
| INPUT POWER (SYSTEM) | 120Vac, 60 Hz | DETECTOR FUNCTION | Peak (PK)<br>Average (AV) |
| ENVIRONMENTAL CONDITIONS | 24deg. C, 64%RH<br>1000 hPa | TESTED BY | Dean Wang |
| TEST MODE | B | | |

| 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 | *2438.00 | 101.24 PK | | | 1.08 V | 200 | 70.33 | 30.91 |
| 2 | *2438.00 | 63.32 AV | | | 1.08 V | 200 | 32.41 | 30.91 |
| 3 | 4876.00 | 54.96 PK | 74.00 | -19.04 | 1.07 V | 59 | 18.24 | 36.72 |
| 4 | 4876.00 | 7.74 AV | 54.00 | -46.26 | 1.07 V | 59 | -28.98 | 36.72 |
| 5 | 7314.00 | 59.12 PK | 74.00 | -14.88 | 1.09 V | 76 | 16.38 | 42.74 |
| 6 | 7314.00 | 11.76 AV | 54.00 | -42.24 | 1.09 V | 76 | -30.98 | 42.74 |
| 7 | #9752.00 | 67.68 PK | 81.24 | -13.56 | 1.01 V | 25 | 21.01 | 46.67 |
| 8 | #9752.00 | 20.64 AV | 43.32 | -22.68 | 1.01 V | 25 | -26.03 | 46.67 |
| 9 | 12190.00 | 65.25 PK | 74.00 | -8.75 | 1.30 V | 117 | 18.15 | 47.10 |
| 10 | 12190.00 | 16.69 AV | 54.00 | -37.31 | 1.30 V | 117 | -30.41 | 47.10 |
| 11 | #14628.00 | 67.67 PK | 81.24 | -13.57 | 1.19 V | 120 | 16.38 | 51.29 |
| 12 | #14628.00 | 18.32 AV | 43.32 | -25.00 | 1.19 V | 120 | -32.97 | 51.29 |

**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.
5. " * " : Fundamental frequency
6. "#":The radiated frequency is out the restricted band.
7. The average value of fundamental frequency and harmonics is calculated by using formula as below

Average = Reading value of RBW=1MHz and VBW=10Hz + 20 log (duty cycle)

20 log (Duty cycle) = 20 log (1.68 ms / 100 ms) = -35.49 dB

Therefore

Average=Reading value of RBW=1MHz and VBW=10Hz -35.49 dB

Please see page 22 for plotted duty.

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|---|---|---|---|
| CHANNEL | Channel 14 | FREQUENCY RANGE | 1 ~ 25GHz |
| INPUT POWER (SYSTEM) | 120Vac, 60 Hz | DETECTOR FUNCTION | Peak (PK)<br>Average (AV) |
| ENVIRONMENTAL CONDITIONS | 24deg. C, 64%RH<br>1000 hPa | TESTED BY | Dean Wang |
| TEST MODE | B | | |

| 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 | *2473.00 | 108.77 PK | | | 1.27 H | 271 | 77.75 | 31.02 |
| 2 | *2473.00 | 70.42 AV | | | 1.27 H | 271 | 39.40 | 31.02 |
| 3 | 2483.50 | 50.65 PK | 74.00 | -23.35 | 1.27 H | 271 | 19.59 | 31.06 |
| 4 | 2483.50 | 12.30 AV | 54.00 | -41.70 | 1.27 H | 271 | -18.76 | 31.06 |
| 5 | 4946.00 | 54.73 PK | 74.00 | -19.27 | 1.08 H | 262 | 17.79 | 36.94 |
| 6 | 4946.00 | 7.65 AV | 54.00 | -46.35 | 1.08 H | 262 | -29.29 | 36.94 |
| 7 | 7419.00 | 56.93 PK | 74.00 | -17.07 | 1.14 H | 115 | 13.97 | 42.96 |
| 8 | 7419.00 | 7.94 AV | 54.00 | -46.06 | 1.14 H | 115 | -35.02 | 42.96 |
| 9 | #9892.00 | 62.48 PK | 88.77 | -26.29 | 1.36 H | 115 | 15.64 | 46.84 |
| 10 | #9892.00 | 14.14 AV | 50.42 | -36.28 | 1.36 H | 115 | -32.70 | 46.84 |
| 11 | 12365.00 | 63.15 PK | 74.00 | -10.85 | 1.25 H | 107 | 16.14 | 47.01 |
| 12 | 12365.00 | 15.04 AV | 54.00 | -38.96 | 1.25 H | 107 | -31.97 | 47.01 |
| 13 | #14838.00 | 68.56 PK | 88.77 | -20.21 | 1.00 H | 128 | 17.40 | 51.16 |
| 14 | #14838.00 | 18.71 AV | 50.42 | -31.71 | 1.00 H | 128 | -32.45 | 51.16 |

**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 radiated frequency is out the restricted band.
7. The average value of fundamental frequency and harmonics is calculated by using formula as below

Average = Reading value of RBW=1MHz and VBW=10Hz + 20 log (duty cycle)

20 log (Duty cycle) = 20 log (1.68 ms / 100 ms) = -35.49 dB

Therefore

Average=Reading value of RBW=1MHz and VBW=10Hz -35.49 dB
Please see page 22 for plotted duty.

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|---|---|---|---|
| CHANNEL | Channel 14 | FREQUENCY RANGE | 1 ~ 25GHz |
| INPUT POWER (SYSTEM) | 120Vac, 60 Hz | DETECTOR FUNCTION | Peak (PK)<br>Average (AV) |
| ENVIRONMENTAL CONDITIONS | 24deg. C, 64%RH<br>1000 hPa | TESTED BY | Dean Wang |
| TEST MODE | B | | |

| 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 | *2473.00 | 102.10 PK | | | 1.00 V | 210 | 71.08 | 31.02 |
| 2 | *2473.00 | 64.09 AV | | | 1.00 V | 210 | 33.07 | 31.02 |
| 3 | 2483.50 | 43.98 PK | 74.00 | -30.02 | 1.00 V | 210 | 12.92 | 31.06 |
| 4 | 2483.50 | 5.97 AV | 54.00 | -48.03 | 1.00 V | 210 | -25.09 | 31.06 |
| 5 | 4946.00 | 55.70 PK | 74.00 | -18.30 | 1.10 V | 98 | 18.76 | 36.94 |
| 6 | 4946.00 | 8.59 AV | 54.00 | -45.41 | 1.10 V | 98 | -28.35 | 36.94 |
| 7 | 7419.00 | 61.87 PK | 74.00 | -12.13 | 1.07 V | 98 | 18.91 | 42.96 |
| 8 | 7419.00 | 14.63 AV | 54.00 | -39.37 | 1.07 V | 98 | -28.33 | 42.96 |
| 9 | #9892.00 | 65.56 PK | 82.10 | -16.54 | 1.00 V | 98 | 18.72 | 46.84 |
| 10 | #9892.00 | 18.18 AV | 44.09 | -25.91 | 1.00 V | 98 | -28.66 | 46.84 |
| 11 | 12365.00 | 64.67 PK | 74.00 | -9.33 | 1.27 V | 128 | 17.66 | 47.01 |
| 12 | 12365.00 | 16.72 AV | 54.00 | -37.28 | 1.27 V | 128 | -30.29 | 47.01 |
| 13 | #14838.00 | 69.86 PK | 82.10 | -12.24 | 1.33 V | 115 | 18.70 | 51.16 |
| 14 | #14838.00 | 20.60 AV | 44.09 | -23.49 | 1.33 V | 115 | -30.56 | 51.16 |

**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 radiated frequency is out the restricted band.
7. The average value of fundamental frequency and harmonics is calculated by using formula as below

Average = Reading value of RBW=1MHz and VBW=10Hz + 20 log (duty cycle)

20 log (Duty cycle) = 20 log (1.68 ms / 100 ms) = -35.49 dB

Therefore

Average=Reading value of RBW=1MHz and VBW=10Hz -35.49 dB
Please see page 22 for plotted duty.

## BELOW 1GHz WORST-CASE DATA

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|---|---|---|---|
| CHANNEL | Channel 0 | FREQUENCY RANGE | Below 1000MHz |
| INPUT POWER (SYSTEM) | 120Vac, 60 Hz | DETECTOR FUNCTION | Quasi-Peak |
| ENVIRONMENTAL CONDITIONS | 25deg. C, 62%RH 999 hPa | TESTED BY | Kevin Liang |
| TEST MODE | A | | |

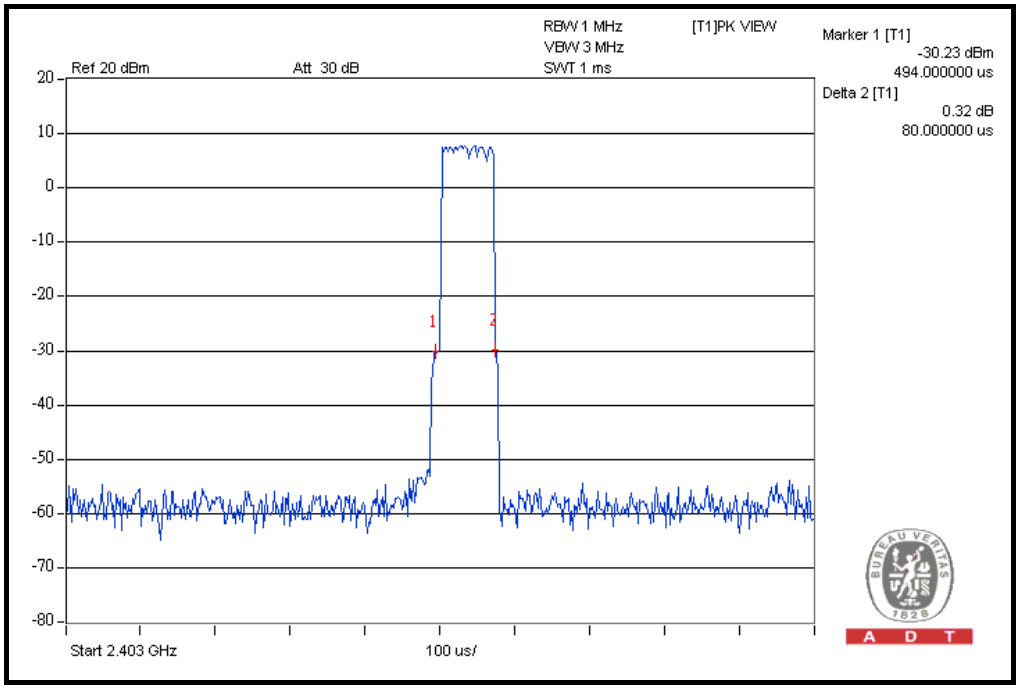
| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 113.50 | 19.01 QP | 43.50 | -24.49 | 1.50 H | 109 | 8.21 | 10.80 |
| 2 | 418.76 | 17.60 QP | 46.00 | -28.40 | 2.00 H | 46 | -0.91 | 18.50 |
| 3 | 514.03 | 21.46 QP | 46.00 | -24.54 | 1.25 H | 274 | 0.37 | 21.09 |
| 4 | 568.47 | 20.42 QP | 46.00 | -25.58 | 2.00 H | 334 | -2.00 | 22.42 |
| 5 | 599.58 | 22.78 QP | 46.00 | -23.22 | 2.00 H | 148 | -0.33 | 23.11 |
| 6 | 675.40 | 23.93 QP | 46.00 | -22.07 | 1.25 H | 10 | -0.19 | 24.12 |
| **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 | 131.00 | 20.61 QP | 43.50 | -22.89 | 1.25 V | 25 | 7.94 | 12.67 |
| 2 | 257.38 | 21.58 QP | 46.00 | -24.42 | 1.50 V | 172 | 8.04 | 13.54 |
| 3 | 292.38 | 20.21 QP | 46.00 | -25.79 | 1.25 V | 208 | 5.04 | 15.18 |
| 4 | 383.76 | 23.28 QP | 46.00 | -22.72 | 1.00 V | 304 | 5.73 | 17.56 |
| 5 | 599.58 | 22.35 QP | 46.00 | -23.65 | 1.00 V | 151 | -0.76 | 23.11 |
| 6 | 659.85 | 23.25 QP | 46.00 | -22.75 | 1.25 V | 211 | -0.67 | 23.91 |

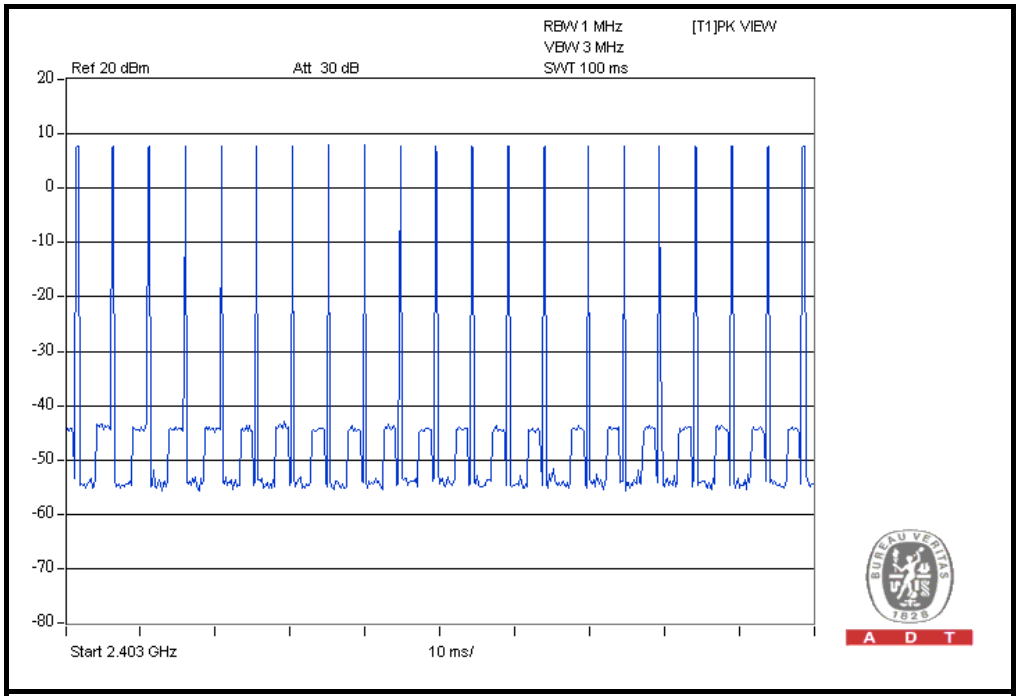
**REMARKS:** 1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|---|---|---|---|
| CHANNEL | Channel 0 | FREQUENCY RANGE | Below 1000MHz |
| INPUT POWER (SYSTEM) | 120Vac, 60 Hz | DETECTOR FUNCTION | Quasi-Peak |
| ENVIRONMENTAL CONDITIONS | 23deg. C, 63%RH 999 hPa | TESTED BY | Sun Lin |
| TEST MODE | B | | |

| 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 | 57.12 | 12.50 QP | 40.00 | -27.50 | 1.25 H | 265 | -0.49 | 13.00 |
| 2 | 152.39 | 15.43 QP | 43.50 | -28.07 | 1.25 H | 178 | 0.86 | 14.57 |
| 3 | 298.21 | 19.28 QP | 46.00 | -26.72 | 1.00 H | 256 | 3.83 | 15.45 |
| 4 | 471.25 | 20.09 QP | 46.00 | -25.91 | 1.25 H | 70 | 0.11 | 19.99 |
| 5 | 613.19 | 20.61 QP | 46.00 | -25.39 | 1.25 H | 142 | -2.68 | 23.29 |
| 6 | 755.12 | 24.33 QP | 46.00 | -21.67 | 1.50 H | 28 | -1.23 | 25.56 |
| 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 | 15.27 QP | 40.00 | -24.73 | 1.00 V | 109 | 1.22 | 14.05 |
| 2 | 94.06 | 13.01 QP | 43.50 | -30.49 | 1.25 V | 283 | 4.14 | 8.87 |
| 3 | 152.39 | 15.15 QP | 43.50 | -28.35 | 1.00 V | 10 | 0.58 | 14.57 |
| 4 | 401.26 | 19.76 QP | 46.00 | -26.24 | 1.00 V | 292 | 1.77 | 17.98 |
| 5 | 525.69 | 21.01 QP | 46.00 | -24.99 | 1.50 V | 220 | -0.38 | 21.39 |
| 6 | 667.63 | 23.76 QP | 46.00 | -22.24 | 2.00 V | 10 | -0.25 | 24.02 |

**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.




20 log (Duty cycle) = 20 log ( 0.08*21 ms / 100 ms) = -35.49 dB

## 4.2 6dB BANDWIDTH MEASUREMENT

### 4.2.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

### 4.2.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | DATE OF CALIBRATION | CALIBRATED UNTIL |
|---|---|---|---|---|
| R&S SPECTRUM ANALYZER | FSP40 | 100040 | Jul. 07, 2009 | Jul. 06, 2010 |

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

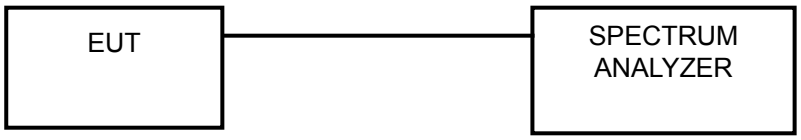
### 4.2.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100kHz RBW and 300kHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

### 4.2.5 TEST SETUP




### 4.2.6 EUT OPERATING CONDITIONS

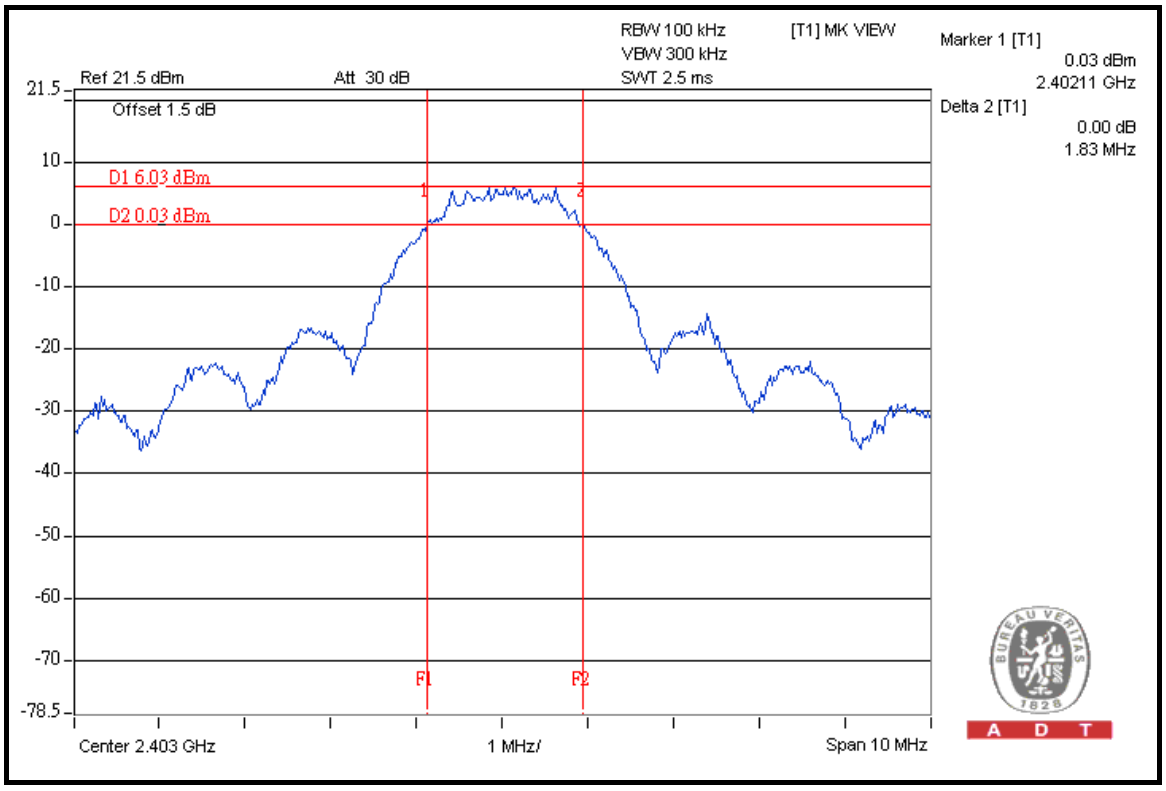
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

## 4.2.7 TEST RESULTS

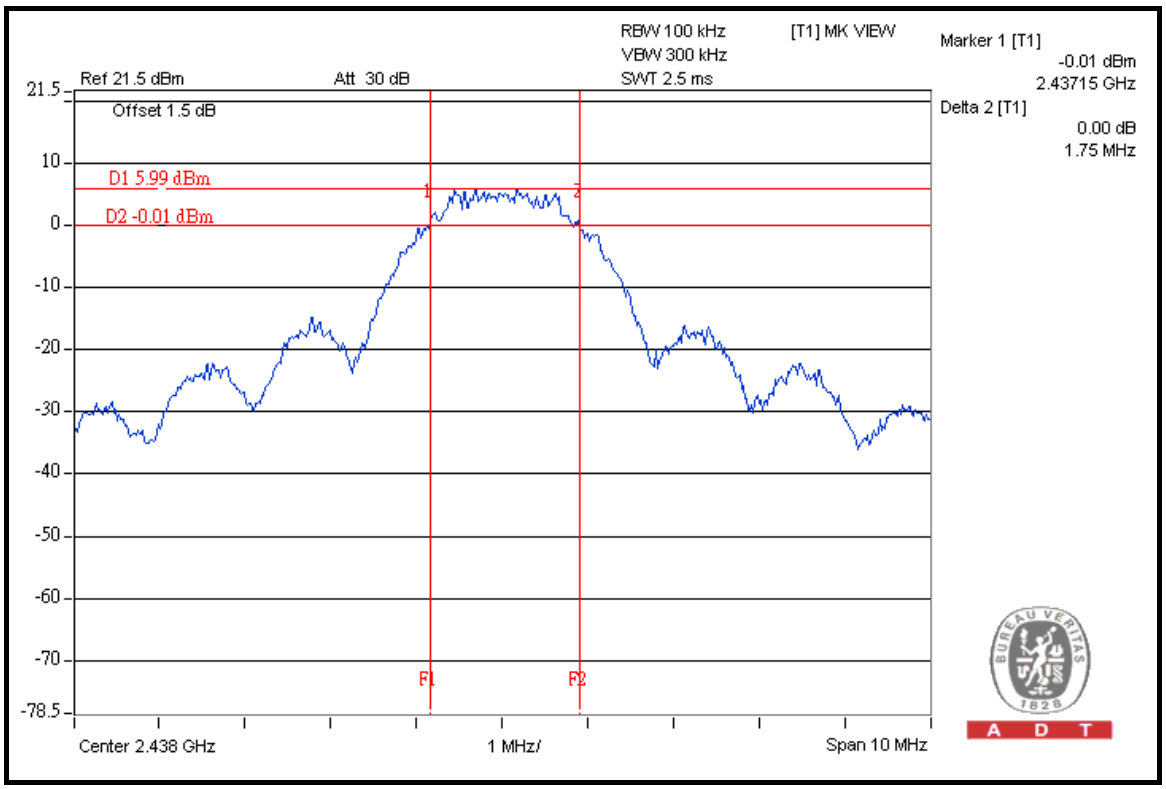
| MODULATION TYPE | MSK | ENVIRONMENTAL CONDITIONS | 25deg.C, 65%RH, 991hPa |
|---|---|---|---|
| INPUT POWER (SYSTEM) | 120Vac, 60 Hz | TESTED BY | Brad Wu |
| TEST MODE | B | | |

| CHANNEL | CHANNEL FREQUENCY (MHz) | 6dB BANDWIDTH (MHz) | MINIMUM LIMIT (MHz) | PASS / FAIL |
|---|---|---|---|---|
| 0 | 2403 | 1.83 | 0.5 | PASS |
| 7 | 2438 | 1.75 | 0.5 | PASS |
| 14 | 2473 | 1.62 | 0.5 | PASS |

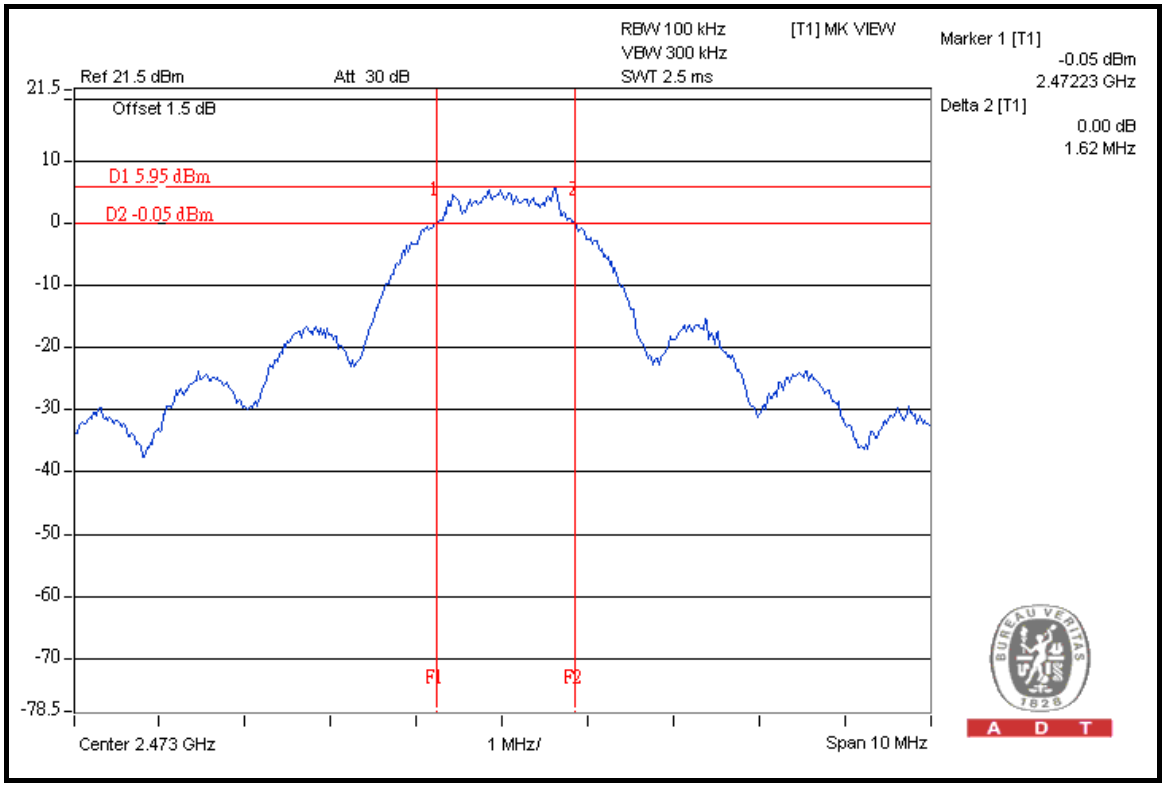
**CH 0**



## CH 7


RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
[T1] MK VIEW
Marker 1 [T1]
-0.01 dBm
2.43715 GHz
Delta 2 [T1]
0.00 dB
1.75 MHz
Ref 21.5 dBm
Att 30 dB
Offset 1.5 dB
D1 5.99 dBm
D2 -0.01 dBm
21.5
10
0
-10
-20
-30
-40
-50
-60
-70
-78.5
F1
F2
Center 2.438 GHz
1 MHz/
Span 10 MHz

## CH 14


RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
[T1] MK VIEW
Marker 1 [T1]
-0.05 dBm
2.47223 GHz
Delta 2 [T1]
0.00 dB
1.62 MHz
Ref 21.5 dBm
Att 30 dB
Offset 1.5 dB
D1 5.95 dBm
D2 -0.05 dBm
21.5
10
0
-10
-20
-30
-40
-50
-60
-70
-78.5
F1
F2
Center 2.473 GHz
1 MHz/
Span 10 MHz

## 4.3 MAXIMUM PEAK OUTPUT POWER

### 4.3.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Measurement is 30dBm.

### 4.3.2 INSTRUMENTS

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | DATE OF CALIBRATION | CALIBRATED UNTIL |
|---|---|---|---|---|
| High Speed Peak Power Meter | ML2495A | 0824012 | Aug. 04, 2008 | Aug. 03, 2009 |
| Power Sensor | MA2411B | 0738138 | Aug. 04, 2008 | Aug. 03, 2009 |

**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. Measurement Bandwidth of ML2495A is 65MHz greater than 6dB bandwidth of emission.

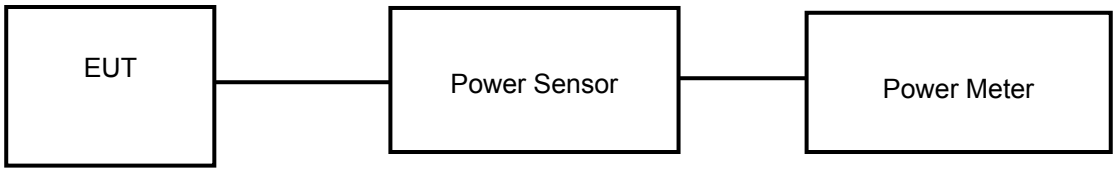
### 4.4.3 TEST PROCEDURES

A power sensor was used on the output port of the EUT. A power meter was used to read the response of the power sensor. Record the power level.

### 4.4.4 DEVIATION FROM TEST STANDARD

No deviation.

### 4.4.5 TEST SETUP




### 4.4.6 EUT OPERATING CONDITIONS

Same as Item 4.3.6.

### 4.4.7 TEST RESULTS

| | | | |
|---|---|---|---|
| **MODULATION TYPE** | MSK | **ENVIRONMENTAL CONDITIONS** | 25deg.C, 65%RH, 991hPa |
| **INPUT POWER (SYSTEM)** | 120Vac, 60 Hz | **TESTED BY** | Brad Wu |
| **TEST MODE** | **B** | | |

| CHAN | CHANNEL FREQUENCY (MHz) | PEAK POWER OUTPUT (mW) | PEAK POWER OUTPUT (dBm) | PEAK POWER LIMIT (dBm) | PASS/FAIL |
|---|---|---|---|---|---|
| 0 | 2403 | 7.69 | 8.86 | 30 | PASS |
| 7 | 2438 | 7.41 | 8.70 | 30 | PASS |
| 14 | 2473 | 7.48 | 8.74 | 30 | PASS |

## 4.4 POWER SPECTRAL DENSITY MEASUREMENT

### 4.4.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm.

### 4.4.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | DATE OF CALIBRATION | CALIBRATED UNTIL |
|---|---|---|---|---|
| R&S SPECTRUM ANALYZER | FSP40 | 100040 | Jul. 07, 2009 | Jul. 06, 2010 |

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

### 4.4.3 TEST PROCEDURE

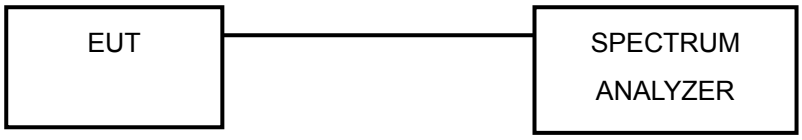
The transmitter output was connected to the spectrum analyzer through an attenuator, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3kHz RBW and 30kHz VBW, set sweep time = span/3kHz. The power spectral density was measured and recorded.

The sweep time is allowed to be longer than span/3kHz for a full response of the mixer in the spectrum analyzer.

### 4.4.4 DEVIATION FROM TEST STANDARD

No deviation.

### 4.4.5 TEST SETUP




### 4.4.6 EUT OPERATING CONDITION

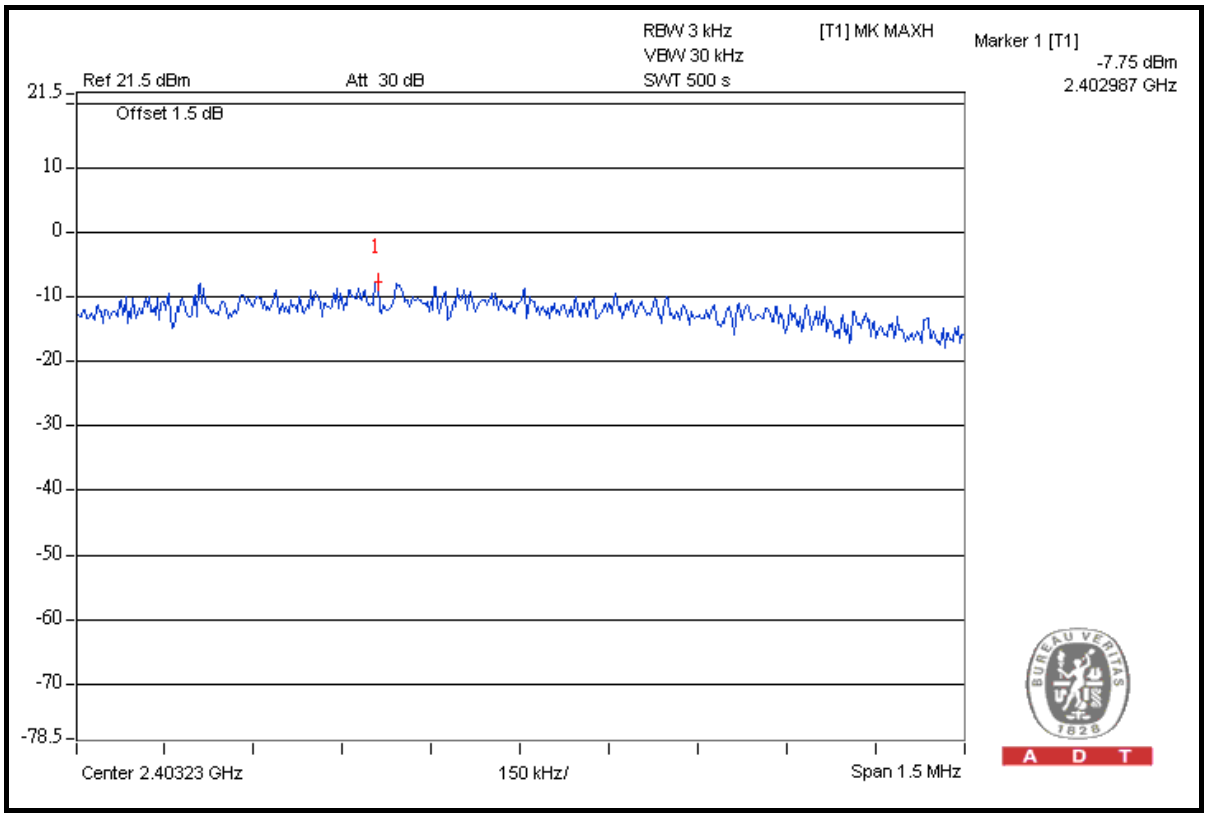
Same as Item 4.3.6.

## 4.4.7 TEST RESULTS

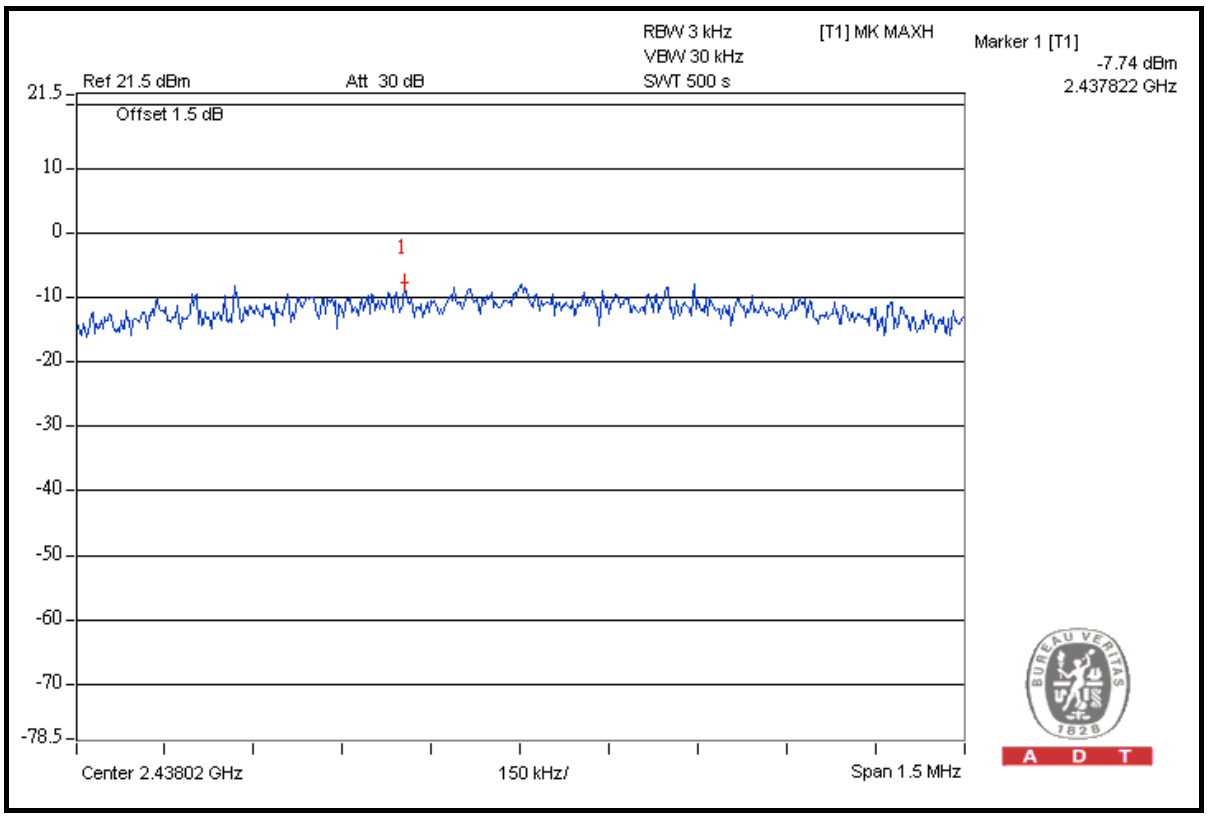
| MODULATION TYPE | MSK | ENVIRONMENTAL CONDITIONS | 25deg.C, 65%RH, 991hPa |
|---|---|---|---|
| INPUT POWER (SYSTEM) | 120Vac, 60 Hz | TESTED BY | Brad Wu |
| TEST MODE | B | | |

| CHANNEL | CHANNEL FREQUENCY (MHz ) | RF POWER LEVEL IN 3 kHz BW (dBm) | MAXIMUM LIMIT (dBm) | PASS/FAIL |
|---|---|---|---|---|
| 0 | 2403 | -7.75 | 8 | PASS |
| 7 | 2438 | -7.74 | 8 | PASS |
| 14 | 2473 | -7.74 | 8 | PASS |

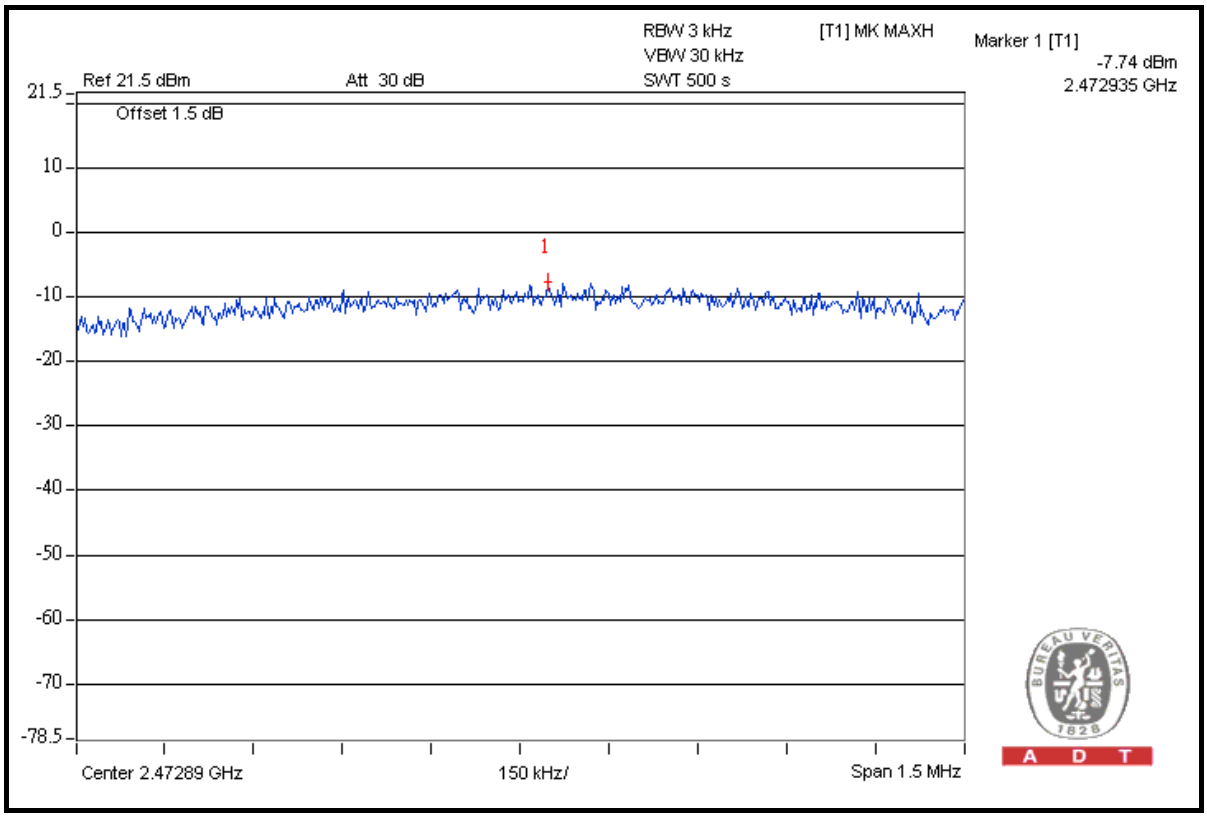
**CH 0**



## CH 7


RBW 3 kHz
VBW 30 kHz
SWT 500 s
[T1] MK MAXH
Marker 1 [T1]
-7.74 dBm
2.437822 GHz
Ref 21.5 dBm
Att 30 dB
Offset 1.5 dB
21.5
10
0
-10
-20
-30
-40
-50
-60
-70
-78.5
1
Center 2.43802 GHz
150 kHz/
Span 1.5 MHz

## CH 14


RBW 3 kHz
VBW 30 kHz
SWT 500 s
[T1] MK MAXH
Marker 1 [T1]
-7.74 dBm
2.472935 GHz
Ref 21.5 dBm
Att 30 dB
Offset 1.5 dB
21.5
10
0
-10
-20
-30
-40
-50
-60
-70
-78.5
1
Center 2.47289 GHz
150 kHz/
Span 1.5 MHz

## 4.5 BAND EDGES MEASUREMENT

### 4.5.1 LIMITS OF BAND EDGES MEASUREMENT

Below –20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

### 4.5.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | DATE OF CALIBRATION | CALIBRATED UNTIL |
|---|---|---|---|---|
| R&S SPECTRUM ANALYZER | FSP40 | 100040 | Jul. 07, 2009 | Jul. 06, 2010 |

**NOTE:** 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 PROCEDURE

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

The spectrum plots (Peak RBW = 100kHz, VBW = 300kHz; Average RBW = 1MHz, VBW = 10Hz) are attached on the following pages.

### 4.5.4 DEVIATION FROM TEST STANDARD

No deviation.

### 4.5.5 EUT OPERATING CONDITION

Same as Item 4.3.6.

### 4.5.6 TEST RESULTS

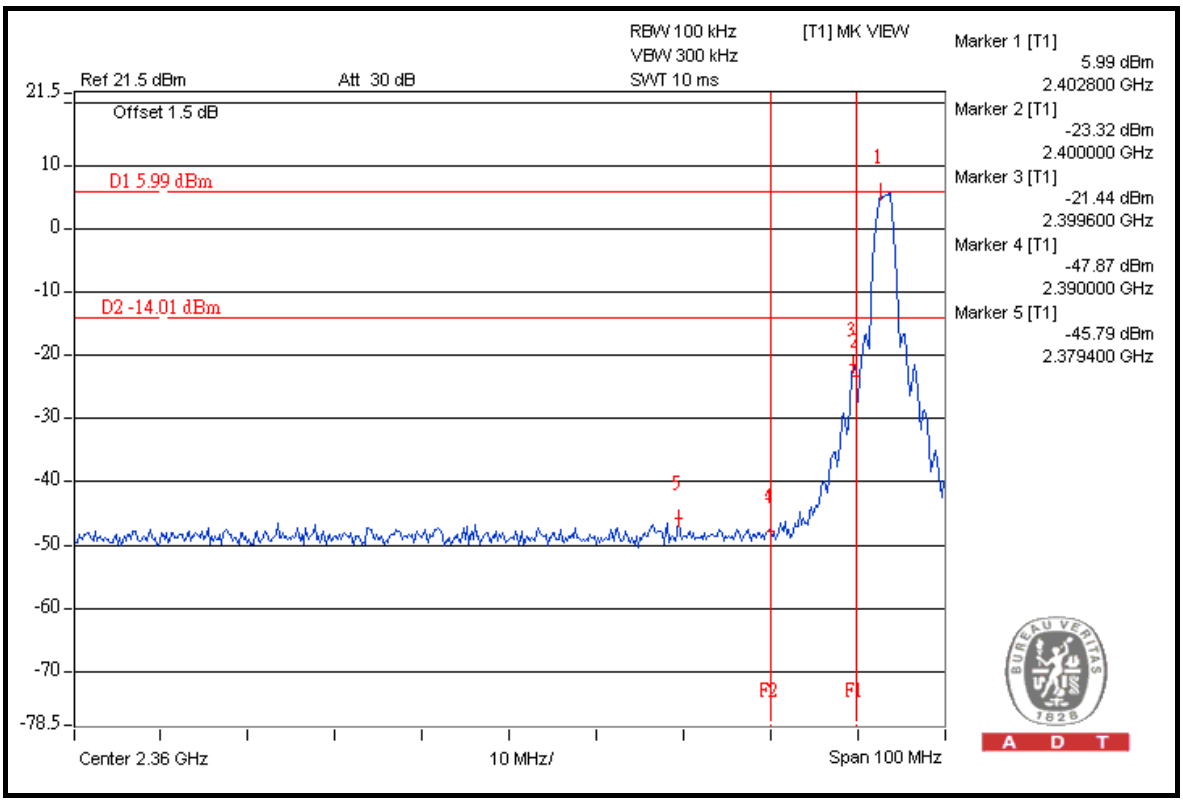
The spectrum plots are attached on the following 6 images. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement in part 15.247(d).

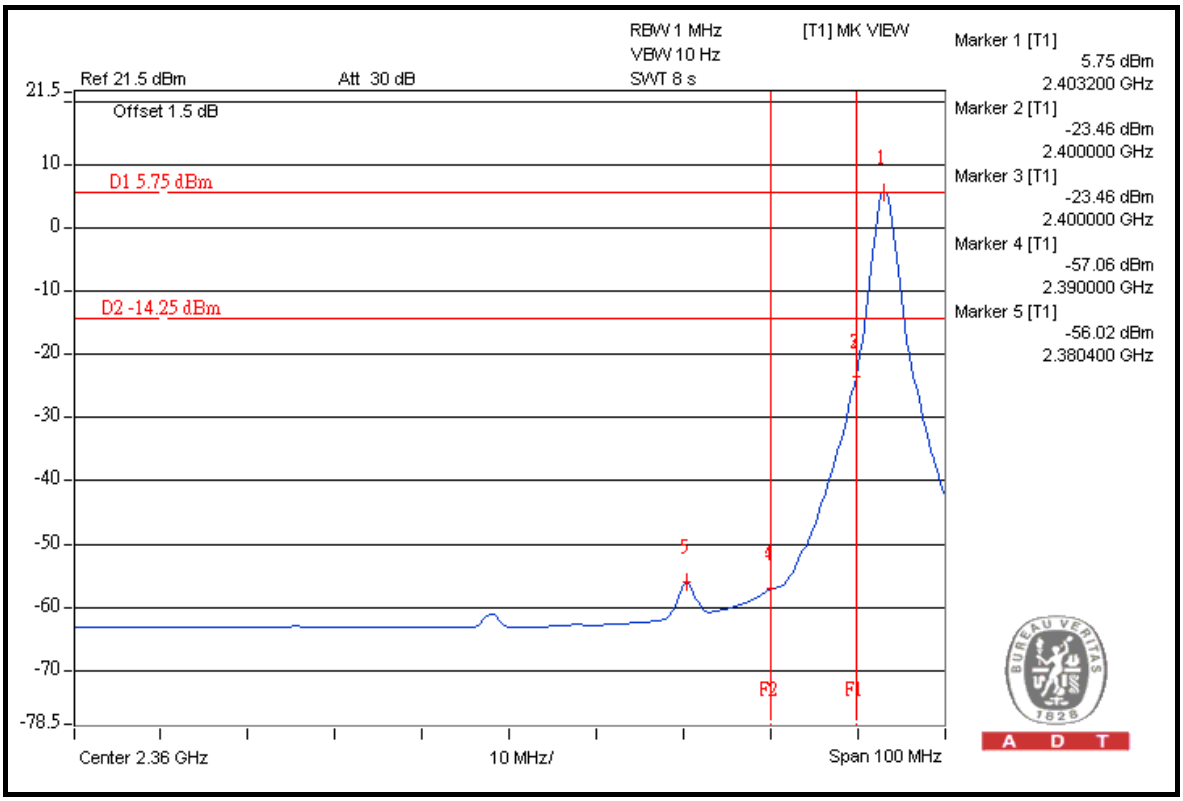
**NOTE 1:** The band edge emission plot on the next second page shows 51.78dBc between carrier maximum power and local maximum emission in restrict band (2.3794GHz). The emission of carrier strength list in the test result of channel 0 at the item 4.1.7 is 109.32dBuV/m (Peak), so the maximum field strength in restrict band is 109.32 – 51.78 = 57.54dBuV/m which is under 74dBuV/m limit.

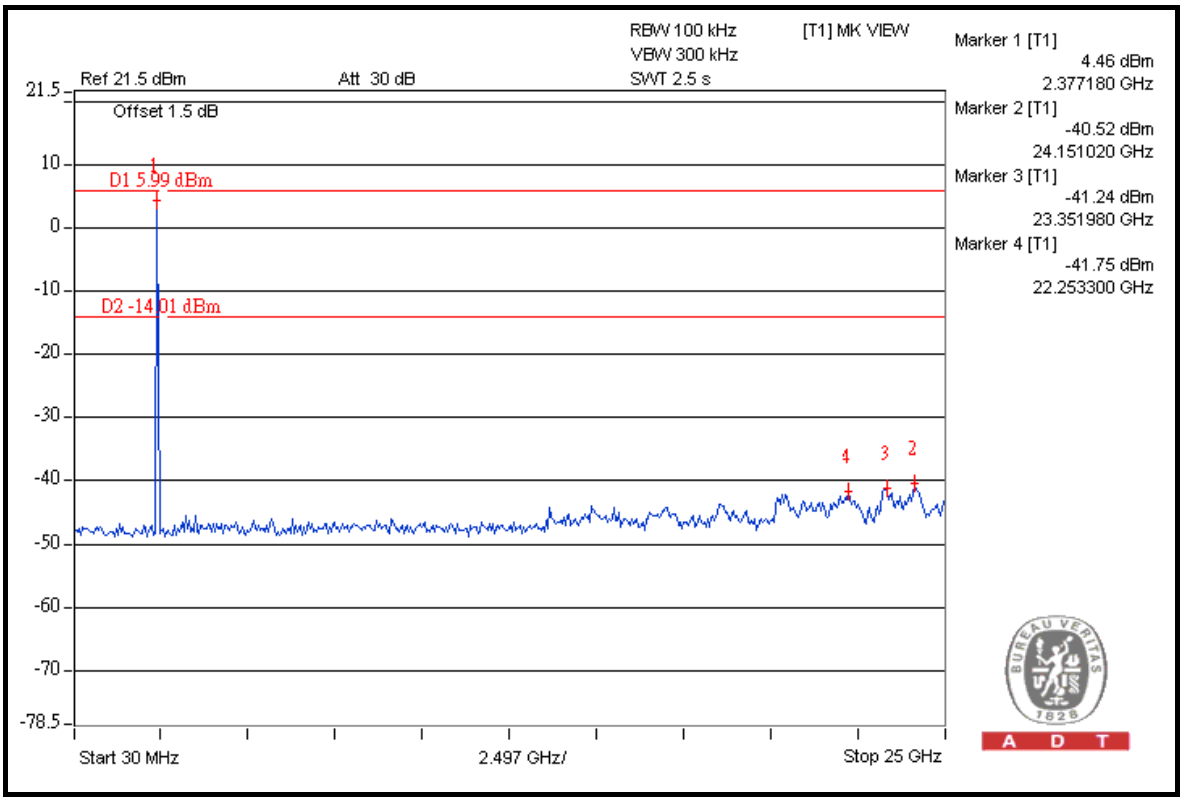
The band edge emission plot on the next second page shows 61.77dBc between carrier maximum power and local maximum emission in restrict band (2.3804GHz). The emission of carrier strength list in the test result of channel 0 at the item 4.1.7 is 71.02dBuV/m (Average), so the maximum field strength in restrict band is 71.02 – 61.77 = 9.25dBuV/m which is under 54dBuV/m limit.

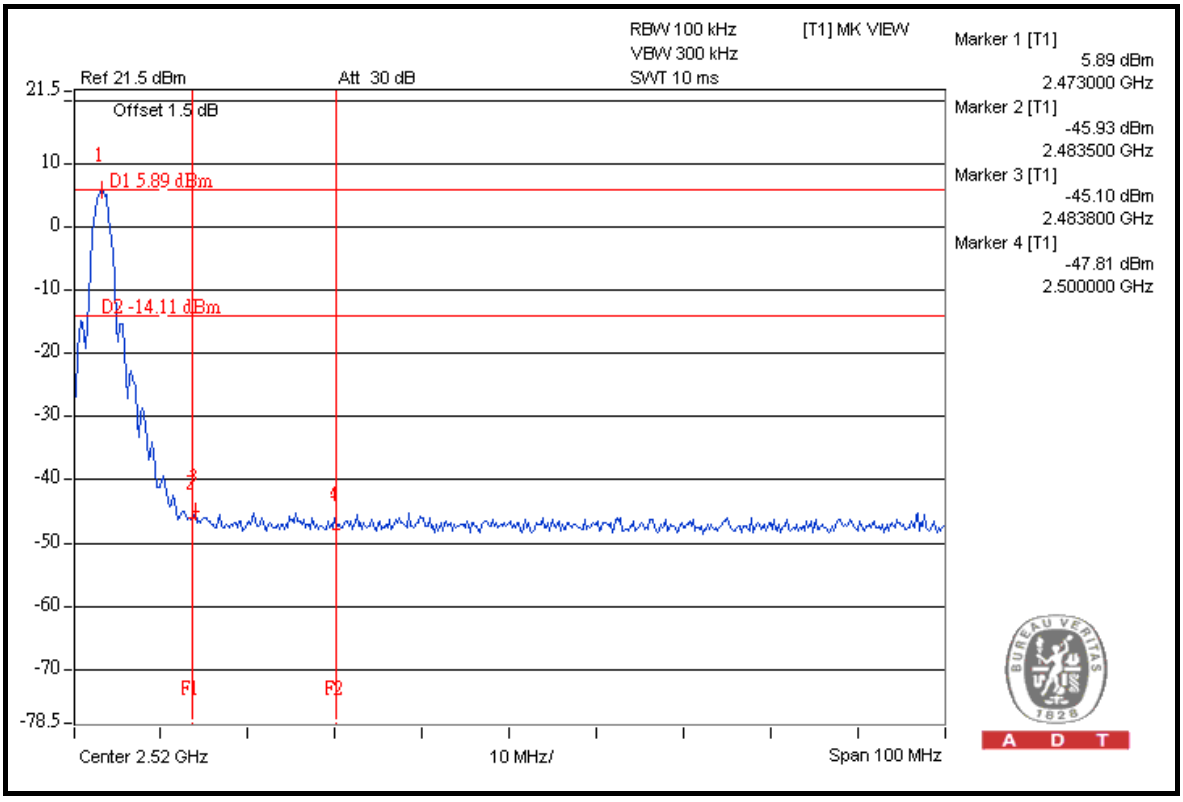
**NOTE 2:** The band edge emission plot on the next third page shows 50.99dBc between carrier maximum power and local maximum emission in restrict band (2.4838GHz). The emission of carrier strength list in the test result of channel 14 at the item 4.1.7 is 108.77dBuV/m (Peak), so the maximum field strength in restrict band is 108.77 – 50.99 = 57.78dBuV/m which is under 74dBuV/m limit.

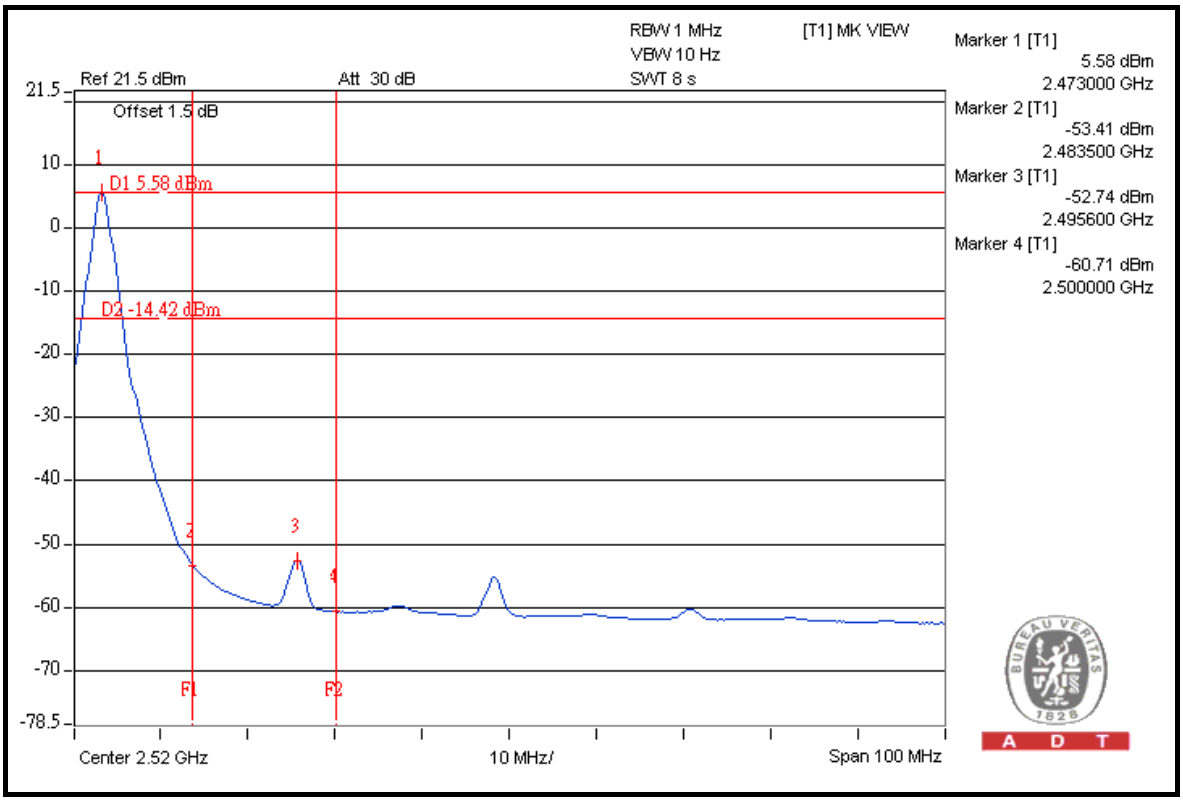
The band edge emission plot on the next fourth page shows 58.32dBc between carrier maximum power and local maximum emission in restrict band (2.4956GHz). The emission of carrier strength list in the test result of channel 14 at the item 4.1.7 is 70.42dBuV/m (Average), so the maximum field strength in restrict band is 70.42 – 58.32 = 12.10dBuV/m which is under 54dBuV/m limit.

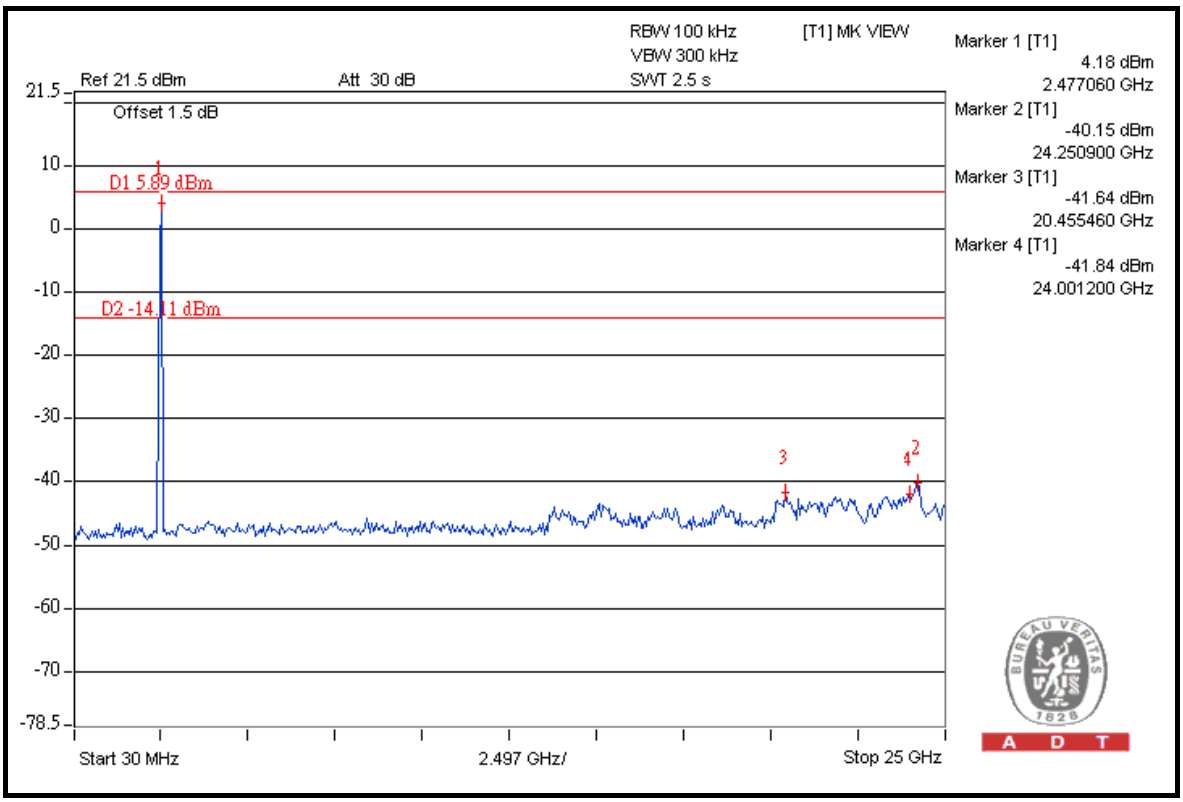

RBW 100 kHz
VBW 300 kHz
SWT 10 ms
[T1] MK VIEW
Ref 21.5 dBm
Att 30 dB
Offset 1.5 dB
D1 5.99 dBm
D2 -14.01 dBm
21.5
10
0
-10
-20
-30
-40
-50
-60
-70
-78.5
Center 2.36 GHz
10 MHz/
Span 100 MHz
Marker 1 [T1]
5.99 dBm
2.402800 GHz
Marker 2 [T1]
-23.32 dBm
2.400000 GHz
Marker 3 [T1]
-21.44 dBm
2.399600 GHz
Marker 4 [T1]
-47.87 dBm
2.390000 GHz
Marker 5 [T1]
-45.79 dBm
2.379400 GHz


RBW 1 MHz
VBW 10 Hz
SWT 8 s
[T1] MK VIEW
Ref 21.5 dBm
Att 30 dB
Offset 1.5 dB
D1 5.75 dBm
D2 -14.25 dBm
21.5
10
0
-10
-20
-30
-40
-50
-60
-70
-78.5
Center 2.36 GHz
10 MHz/
Span 100 MHz
Marker 1 [T1]
5.75 dBm
2.403200 GHz
Marker 2 [T1]
-23.46 dBm
2.400000 GHz
Marker 3 [T1]
-23.46 dBm
2.400000 GHz
Marker 4 [T1]
-57.06 dBm
2.390000 GHz
Marker 5 [T1]
-56.02 dBm
2.380400 GHz


RBW 100 kHz
VBW 300 kHz
SWT 2.5 s
[T1] MK VIEW
Ref 21.5 dBm
Att 30 dB
Offset 1.5 dB
D1 5.99 dBm
D2 -14.01 dBm
Marker 1 [T1]
4.46 dBm
2.377180 GHz
Marker 2 [T1]
-40.52 dBm
24.151020 GHz
Marker 3 [T1]
-41.24 dBm
23.351980 GHz
Marker 4 [T1]
-41.75 dBm
22.253300 GHz
21.5
10
0
-10
-20
-30
-40
-50
-60
-70
-78.5
Start 30 MHz
2.497 GHz/
Stop 25 GHz


RBW 100 kHz
VBW 300 kHz
SWT 10 ms
[T1] MK VIEW
Ref 21.5 dBm
Att 30 dB
Offset 1.5 dB
D1 5.89 dBm
D2 -14.11 dBm
Marker 1 [T1]
5.89 dBm
2.473000 GHz
Marker 2 [T1]
-45.93 dBm
2.483500 GHz
Marker 3 [T1]
-45.10 dBm
2.483800 GHz
Marker 4 [T1]
-47.81 dBm
2.500000 GHz
21.5
10
0
-10
-20
-30
-40
-50
-60
-70
-78.5
F1
F2
Center 2.52 GHz
10 MHz/
Span 100 MHz


RBW 1 MHz
VBW 10 Hz
SWT 8 s
[T1] MK VIEW
Ref 21.5 dBm
Att 30 dB
Offset 1.5 dB
D1 5.58 dBm
D2 -14.42 dBm
21.5
10
0
-10
-20
-30
-40
-50
-60
-70
-78.5
F1
F2
Center 2.52 GHz
10 MHz/
Span 100 MHz
Marker 1 [T1]
5.58 dBm
2.473000 GHz
Marker 2 [T1]
-53.41 dBm
2.483500 GHz
Marker 3 [T1]
-52.74 dBm
2.495600 GHz
Marker 4 [T1]
-60.71 dBm
2.500000 GHz


RBW 100 kHz
VBW 300 kHz
SWT 2.5 s
[T1] MK VIEW
Ref 21.5 dBm
Att 30 dB
Offset 1.5 dB
D1 5.89 dBm
D2 -14.11 dBm
21.5
10
0
-10
-20
-30
-40
-50
-60
-70
-78.5
Start 30 MHz
2.497 GHz/
Stop 25 GHz
Marker 1 [T1]
4.18 dBm
2.477060 GHz
Marker 2 [T1]
-40.15 dBm
24.250900 GHz
Marker 3 [T1]
-41.64 dBm
20.455460 GHz
Marker 4 [T1]
-41.84 dBm
24.001200 GHz

## 4.6 ANTENNA REQUIREMENT

### 4.6.1 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 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### 4.6.2 ANTENNA CONNECTED CONSTRUCTION

The antenna used in this product is Inverted F antenna without antenna connector. The maximum Gain of the antenna is 4.65dBi.

# 5. PHOTOGRAPHS OF THE TEST CONFIGURATION

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

# 6. INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

| | |
|---|---|
| **USA** | FCC, NVLAP |
| **Germany** | TUV Rheinland |
| **Japan** | VCCI |
| **Norway** | NEMKO |
| **Canada** | INDUSTRY CANADA , CSA |
| **R.O.C.** | TAF, BSMI, NCC |
| **Netherlands** | Telefication |
| **Singapore** | 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: 886-2-26051924

**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


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 ---**