# FCC TEST REPORT

**REPORT NO.:** RF960808A07B
**MODEL NO.:** BT-393
**RECEIVED:** Aug. 8, 2007
**TESTED:** Aug. 16 ~ Sep. 3, 2007
**ISSUED:** Sep. 11, 2008

**APPLICANT:** Impextronic International Inc.

**ADDRESS:** 8F-1,No.85,Sec1. ZhongXiao East Road, Taipei. Taiwan

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

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

# TABLE OF CONTENTS

# 1. CERTIFICATION

| | |
|---|---|
| **PRODUCT:** | Bluetooth Monaural Headset |
| **BRAND NAME:** | Blue Eagle |
| **MODEL NO.:** | BT-393 |
| **APPLICANT:** | Impextronic International Inc. |
| **TESTED:** | Aug. 16 ~ Sep. 3, 2007 |
| **TEST SAMPLE:** | MASS-PRODUCTION |
| **STANDARDS:** | FCC Part 15, Subpart C (Section 15.247), ANSI C63.4-2003 |

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

**PREPARED BY** : Annie Chang , **DATE:** Sep. 11, 2008
( Annie Chang / Senior Specialist )

**TECHNICAL ACCEPTANCE** : Jamison Chan , **DATE:** Sep. 11, 2008
Responsible for RF
( Jamison Chan / Supervisor )

**APPROVED BY** : Ken Liu , **DATE:** Sep. 11, 2008
( Ken Liu / Deputy Manager )

## 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 | PASS | Meets Class B Limit<br>Minimum passing margin is –3.78dB at 0.304MHz |
| 15.247(a)(1)(iii) | Number of Hopping Frequency Used Spec.: At least 15 channels | PASS | Meet the requirement of limit. |
| 15.247(a)(1)(iii) | Dwell Time on Each Channel<br>Spec. : Max. 0.4 second within 31.6 second | PASS | Meet the requirement of limit. |
| 15.247(a)(1) | 1. Hopping Channel Separation<br>Spec. : Min. 25 kHz or 20 dB bandwidth, whichever is greater<br>(see Note )<br>2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System | PASS | Meet the requirement of limit. |
| 15.247(b) | Maximum Peak Output Power<br>Spec.: max. 21dBm<br>(see Note ) | PASS | Meet the requirement of limit. |
| 15.247(d) | Transmitter Radiated Emissions<br>Spec.: Table 15.209 | PASS | Meet the requirement of limit.<br>Minimum passing margin is –1.12dB at 4960.000MHz. |
| 15.247(d) | Band Edge Measurement | PASS | Meet the requirement of limit. |

**NOTE:** If The Frequency Hopping System operating in 2400-2483.5MHz band and the output power less than 125mW. The hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of hopping channel whichever is greater.

## 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:

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

| MEASUREMENT | FREQUENCY | UNCERTAINTY |
|---|---|---|
| Conducted emissions | 9kHz ~ 30MHz | 2.44 dB |
| Radiated emissions | 30MHz ~ 1GHz | 3.75 dB |
| | 1GHz ~ 40GHz | 2.89 dB |

# 3. GENERAL INFORMATION

## 3.1 GENERAL DESCRIPTION OF EUT

| | |
|---|---|
| **PRODUCT** | Bluetooth Monaural Headset |
| **MODEL NO.** | BT-393 |
| **FCC ID** | WO3-BT393 |
| **POWER SUPPLY** | 3.7Vdc from battery,<br>5Vdc from adapter |
| **MODULATION TYPE** | GFSK, $\pi$ /4-DQPSK, 8DPSK |
| **MODULATION TECHNOLOGY** | FHSS |
| **TRANSFER RATE** | 1/2/3Mbps |
| **OPERATING FREQUENCY** | 2402 ~ 2480MHz |
| **NUMBER OF CHANNEL** | 79 |
| **OUTPUT POWER** | 0.459mW |
| **ANTENNA TYPE** | Chip antenna with 1.5dBi gain |
| **DATA CABLE** | NA |
| **I/O PORTS** | NA |

**NOTE:**

1. The EUT is a wireless headset, with Bluetooth technology.

2. The EUT was power supplied from the following power adapters and car charger(for charging mode only):

| Item | Brand | Model No. | Power Rating |
|---|---|---|---|
| Adapter 1 | GME | GFP051U-0510 | AC I/P: 100-240V, 50/60Hz, 0.2A<br>DC O/P: 5V, 1A |
| Adapter 2 | Nandao Electromachinery Co., Ltd | ND-0500800Z | AC I/P: 100-240V, 50/60Hz, 0.18A<br>DC O/P: 5V, 800mA |
| car charger | HOP SHING ELECTRICAl LTD | CLA5V08A-Mini USB | DC I/P: 12-24V, 800mA Max<br>DC O/P: 5Vdc, 1A |

※The EUT could not transmit or receive under charging mode.

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

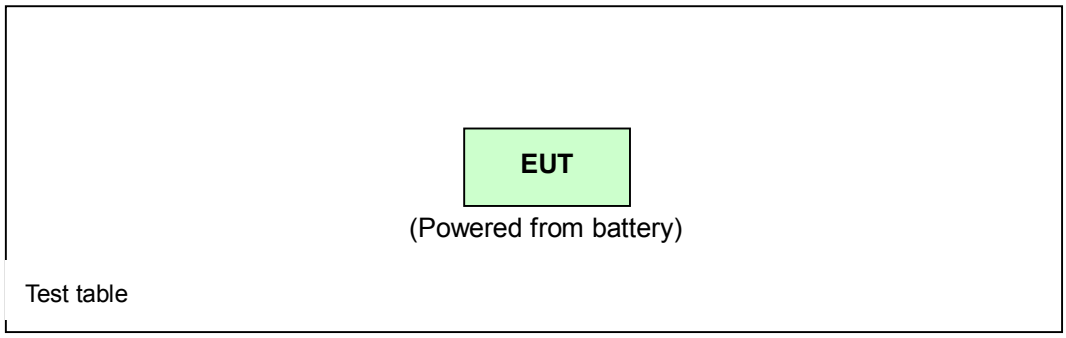
## 3.2 DESCRIPTION OF TEST MODES

79 channels are provided to this EUT:

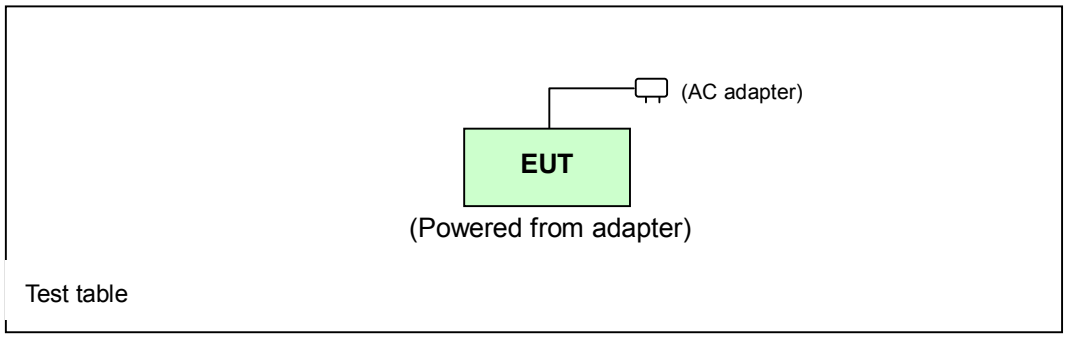
| CHANNEL | FREQ. (MHz) | CHANNEL | FREQ. (MHz) | CHANNEL | FREQ. (MHz) | CHANNEL | FREQ. (MHz) |
|---|---|---|---|---|---|---|---|
| 0 | 2402 | 20 | 2422 | 40 | 2442 | 60 | 2462 |
| 1 | 2403 | 21 | 2423 | 41 | 2443 | 61 | 2463 |
| 2 | 2404 | 22 | 2424 | 42 | 2444 | 62 | 2464 |
| 3 | 2405 | 23 | 2425 | 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 | 2432 | 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 | | |

## 3.2.1 CONFIGURATION OF SYSTEM UNDER TEST

**For Mode A:**




**For Mode B~C:**



## 3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

| EUT CONFIGURE MODE | Applicable to | | | | Description |
|---|---|---|---|---|---|
| | PLC | RE<1G | RE≥1G | APCM | |
| A | Note | √ | √ | √ | Operating mode (EUT stand-alone) |
| B | √ | - | - | - | Charging mode (EUT w. adapter1) |
| C | √ | - | - | - | Charging mode (EUT w. adapter2) |

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

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

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

**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.

| EUT CONFIGURE MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | PACKET TYPE | DATE RATE |
|---|---|---|---|---|---|---|
| B | 0 to 78 | - | FHSS | GFSK | DH5 | 1 |
| C | 0 to 78 | - | FHSS | GFSK | DH5 | 1 |

**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, packet types data rate, 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 TECHNOLOGY | MODULATION TYPE | PACKET TYPE | DATE RATE | AXIS |
|---|---|---|---|---|---|---|---|
| A | 0 to 78 | 78 | FHSS | GFSK | DH5 | 1 | X |

**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, packet types data rate, 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 TECHNOLOGY | MODULATION TYPE | PACKET TYPE | DATE RATE | AXIS |
|---|---|---|---|---|---|---|---|
| A | 0 to 78 | 0, 39, 78 | FHSS | GFSK | DH5 | 1 | X |
| A | 0 to 78 | 0, 39, 78 | FHSS | 8DPSK | DH5 | 3 | X |

**BANDEDGE MEASUREMENT:**

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types of the antenna 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 TECHNOLOGY | MODULATION TYPE | PACKET TYPE | DATE RATE |
|---|---|---|---|---|---|---|
| A | 0 to 78 | 0, 39, 78 | FHSS | GFSK | DH5 | 1 |
| A | 0 to 78 | 0, 39, 78 | FHSS | 8DPSK | DH5 | 3 |

**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 of the antenna 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 TECHNOLOGY | MODULATION TYPE | PACKET TYPE | DATE RATE |
|---|---|---|---|---|---|---|
| A | 0 to 78 | 0, 39, 78 | FHSS | GFSK | DH5 | 1 |
| A | 0 to 78 | 0, 39, 78 | FHSS | 8DPSK | DH5 | 3 |

## 3.2.3 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 product has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

## 3.2.4 DESCRIPTION OF SUPPORT UNITS

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

| NO. | PRODUCT | BRAND | MODEL NO. | SERIAL NO. | FCC ID |
|---|---|---|---|---|---|
| 1 | Mobile Phone | NOKIA | 6230i | 0526994 | QTKRM-72 |

# 4. TEST TYPES AND RESULTS

## 4.1 CONDUCTED EMISSION MEASUREMENT

### 4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

| FREQUENCY (MHz) | Class A (dBuV) | | Class B (dBuV) | |
|---|---|---|---|---|
| | Quasi-peak | Average | Quasi-peak | Average |
| 0.15 - 0.5 | 79 | 66 | 66 - 56 | 56 - 46 |
| 0.50 - 5.0 | 73 | 60 | 56 | 46 |
| 5.0 - 30.0 | 73 | 60 | 60 | 50 |

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

### 4.1.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|---|---|---|---|---|
| ROHDE & SCHWARZ Test Receiver | ESCS 30 | 838251/021 | Nov. 24, 2006 | Nov. 23, 2007 |
| ROHDE & SCHWARZ Artificial Mains Network (for EUT) | ESH3-Z5 | 100218 | Nov. 22, 2006 | Nov. 21, 2007 |
| LISN With Adapter (for EUT) | AD10 | C10Ada-001 | Nov. 22, 2006 | Nov. 21, 2007 |
| ROHDE & SCHWARZ Artificial Mains Network (for peripherals) | ESH3-Z5 | 100219 | Nov. 08, 2006 | Nov. 07, 2007 |
| ROHDE & SCHWARZ Artificial Mains Network (for peripherals) | ESH3-Z5 | 100220 | Oct. 27, 2006 | Oct. 26, 2007 |
| Software | ADT_Cond_V 7.3.2 | | NA | NA |
| Software | ADT_ISN_V7. 3.2 | | NA | NA |
| RF cable (JYEBAO) | 5D-FB | Cable-C10.01 | Mar. 02, 2007 | Mar. 01, 2008 |
| SUHNER Terminator (For ROHDE & SCHWARZ LISN) | 65BNC-5001 | E1-010773 | Feb. 12, 2007 | Feb. 11, 2008 |

**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. 10.
3. The VCCI Site Registration No. C-1852.

## 4.1.3 TEST PROCEDURE

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.

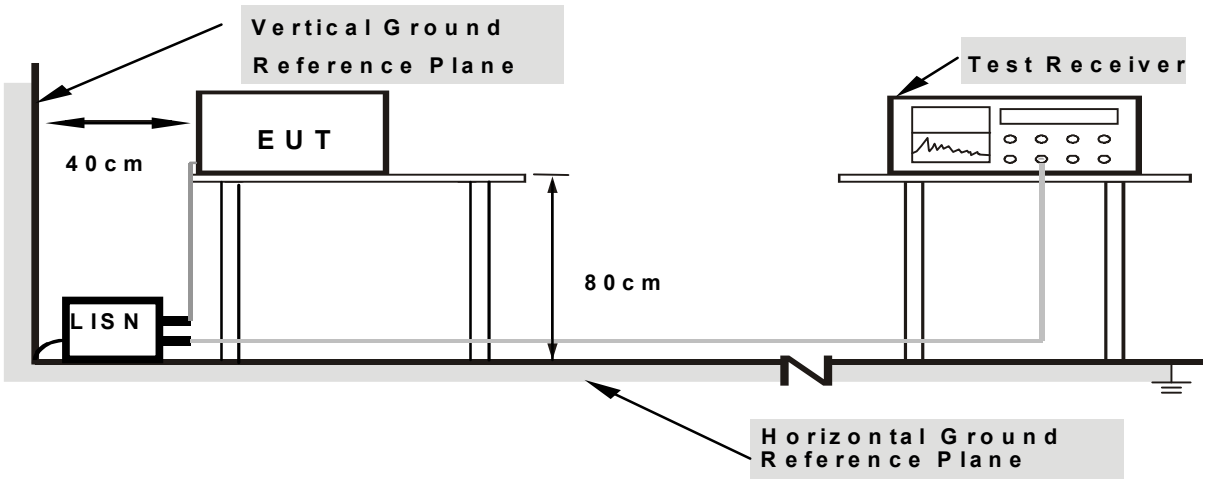
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit - 20dB) were 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) are 80 cm from EUT and at least 80 cm from other units and other metal planes

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

## 4.1.6 EUT OPERATING CONDITIONS

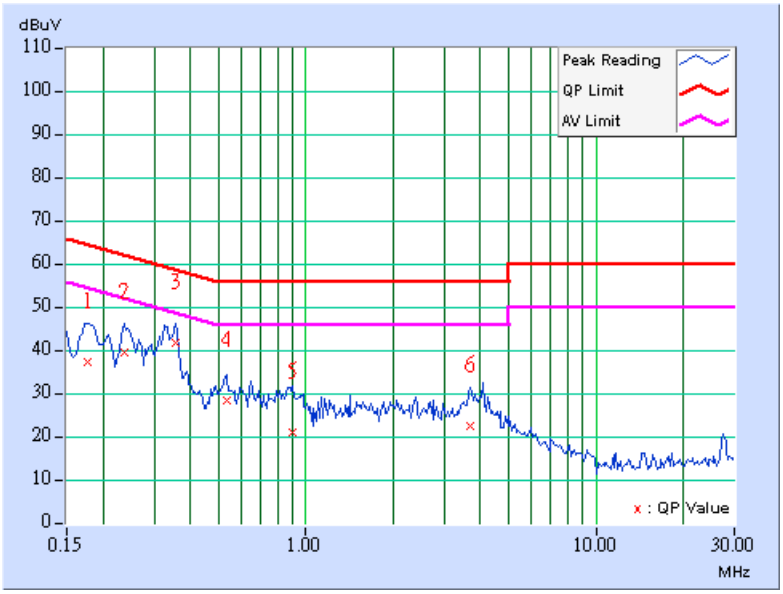
a. Connected the EUT with an AC adapter placed on testing table.
b. Set the EUT under charging condition.

## 4.1.7 TEST RESULTS (1)

| | | | |
|---|---|---|---|
| **TEST MODE** | Mode B | | |
| **INPUT POWER** | 120Vac, 60 Hz | **6dB BANDWIDTH** | 9 kHz |
| **ENVIRONMENTAL CONDITIONS** | 21deg. C, 70% RH, 989hPa | **PHASE** | Line (L) |
| **TESTED BY** | Linden Chang | | |

| 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 | 0.20 | 37.06 | - | 37.26 | - | 64.61 | 54.61 | -27.35 | - |
| 2 | 0.236 | 0.20 | 39.12 | - | 39.32 | - | 62.24 | 52.24 | -22.92 | - |
| 3 | 0.357 | 0.20 | 41.29 | - | 41.49 | - | 58.80 | 48.80 | -17.31 | - |
| 4 | 0.533 | 0.24 | 28.11 | - | 28.35 | - | 56.00 | 46.00 | -27.65 | - |
| 5 | 0.904 | 0.37 | 20.49 | - | 20.86 | - | 56.00 | 46.00 | -35.14 | - |
| 6 | 3.676 | 0.48 | 22.12 | - | 22.60 | - | 56.00 | 46.00 | -33.40 | - |

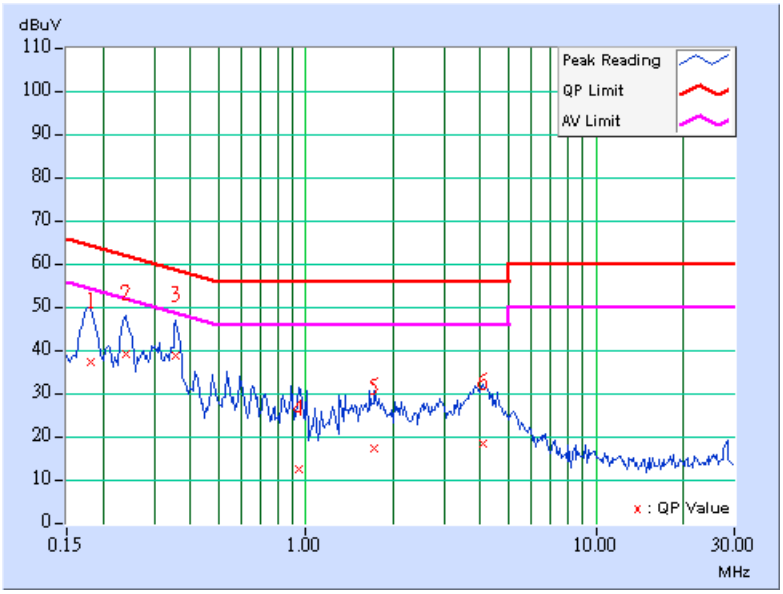
**REMARKS:** 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value =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



| | | | |
|---|---|---|---|
| **TEST MODE** | Mode B | | |
| **INPUT POWER** | 120Vac, 60 Hz | **6dB BANDWIDTH** | 9 kHz |
| **ENVIRONMENTAL CONDITIONS** | 21deg. C, 70% RH, 989hPa | **PHASE** | Neutral (N) |
| **TESTED BY** | Linden Chang | | |

| 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 | 0.181 | 0.20 | 37.02 | - | 37.22 | - | 64.43 | 54.43 | -27.21 | - |
| 2 | 0.240 | 0.20 | 38.83 | - | 39.03 | - | 62.10 | 52.10 | -23.07 | - |
| 3 | 0.357 | 0.20 | 38.62 | - | 38.82 | - | 58.80 | 48.80 | -19.98 | - |
| 4 | 0.951 | 0.29 | 12.20 | - | 12.49 | - | 56.00 | 46.00 | -43.51 | - |
| 5 | 1.719 | 0.30 | 17.07 | - | 17.37 | - | 56.00 | 46.00 | -38.63 | - |
| 6 | 4.082 | 0.40 | 18.22 | - | 18.62 | - | 56.00 | 46.00 | -37.38 | - |

**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.

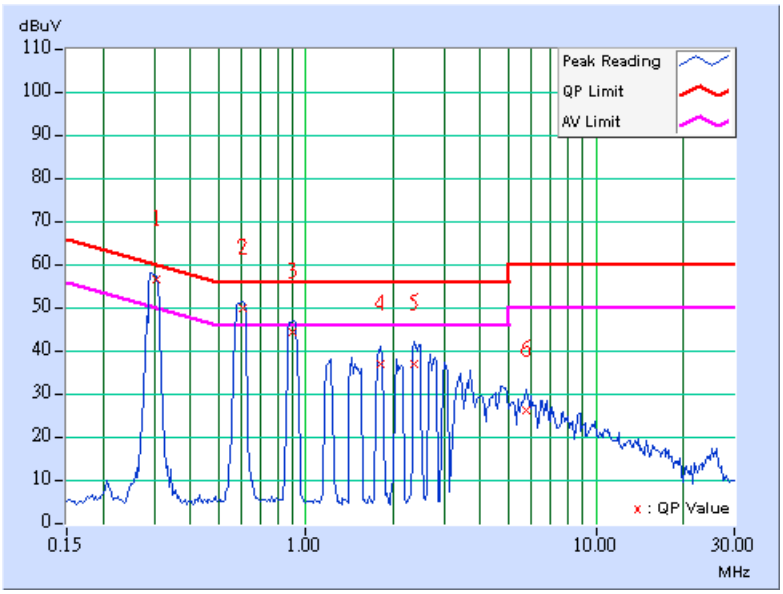


## 4.1.7 TEST RESULTS (2)

| | | | |
|---|---|---|---|
| **TEST MODE** | Mode C | | |
| **INPUT POWER** | 120Vac, 60 Hz | **6dB BANDWIDTH** | 9 kHz |
| **ENVIRONMENTAL CONDITIONS** | 24deg. C, 74% RH, 1004hPa | **PHASE** | Line (L) |
| **TESTED BY** | Jerry Huang | | |

| 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** | **0.304** | **0.30** | **56.06** | **42.10** | **56.36** | **42.40** | **60.14** | **50.14** | **-3.78** | **-7.74** |
| 2 | 0.606 | 0.30 | 49.30 | 36.22 | 49.60 | 36.52 | 56.00 | 46.00 | -6.40 | -9.48 |
| 3 | 0.897 | 0.30 | 44.06 | - | 44.36 | - | 56.00 | 46.00 | -11.64 | - |
| 4 | 1.810 | 0.30 | 36.43 | - | 36.73 | - | 56.00 | 46.00 | -19.27 | - |
| 5 | 2.377 | 0.32 | 36.63 | - | 36.95 | - | 56.00 | 46.00 | -19.05 | - |
| 6 | 5.768 | 0.52 | 25.80 | - | 26.32 | - | 60.00 | 50.00 | -33.68 | - |

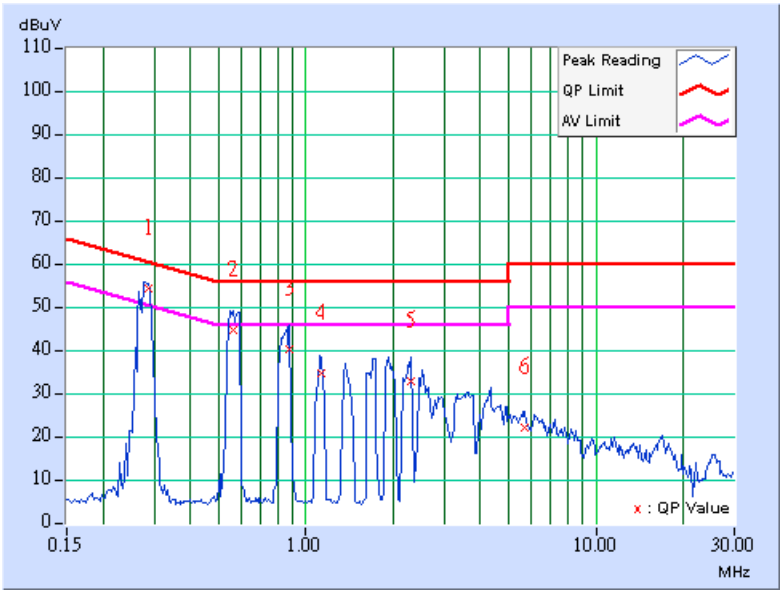
**REMARKS:** 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value =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



| | | | |
|---|---|---|---|
| **TEST MODE** | Mode C | | |
| **INPUT POWER** | 120Vac, 60 Hz | **6dB BANDWIDTH** | 9 kHz |
| **ENVIRONMENTAL CONDITIONS** | 24deg. C, 74% RH, 1004hPa | **PHASE** | Neutral (N) |
| **TESTED BY** | Jerry Huang | | |

| 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 | 0.285 | 0.20 | 54.12 | 38.60 | 54.32 | 38.80 | 60.67 | 50.67 | -6.35 | -11.87 |
| 2 | 0.561 | 0.20 | 44.29 | - | 44.49 | - | 56.00 | 46.00 | -11.51 | - |
| 3 | 0.876 | 0.20 | 39.91 | - | 40.11 | - | 56.00 | 46.00 | -15.89 | - |
| 4 | 1.132 | 0.21 | 34.48 | - | 34.69 | - | 56.00 | 46.00 | -21.31 | - |
| 5 | 2.305 | 0.30 | 32.53 | - | 32.83 | - | 56.00 | 46.00 | -23.17 | - |
| 6 | 5.684 | 0.41 | 21.78 | - | 22.19 | - | 60.00 | 50.00 | -37.81 | - |

**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 RADIATED EMISSION MEASUREMENT

## 4.2.1 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.

## 4.2.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|---|---|---|---|---|
| HP Preamplifier | 8447D | 2432A03504 | May 10, 2007 | May 09, 2008 |
| HP Preamplifier | 8449B | 3008A01924 | Sep. 04, 2006 | Sep. 05, 2007 |
| HP Preamplifier | 8449B | 3008A01638 | Sep. 18, 2006 | Sep. 17, 2007 |
| ROHDE & SCHWARZ TEST RECEIVER | ESI7 | 836697/012 | Oct. 25, 2006 | Oct. 24, 2007 |
| Schwarzbeck Antenna | VULB 9168 | 137 | Oct. 02, 2006 | Oct. 01, 2007 |
| Schwarzbeck Antenna | VHBA 9123 | 480 | Apr. 19, 2007 | Apr. 18, 2008 |
| EMCO Horn Antenna | 3115 | 6714 | Oct. 25, 2006 | Oct. 24, 2007 |
| EMCO Horn Antenna | 3115 | 9312-4192 | Apr. 20, 2007 | Apr. 19, 2008 |
| ADT. Turn Table | TT100 | 0306 | NA | NA |
| ADT. Tower | AT100 | 0306 | NA | NA |
| Software | ADT_Radiated _V7.6.15 | NA | NA | NA |
| SUHNER RF cable | SF104-26.5 | CABLE-CH6-17 m-01 | Dec. 12, 2006 | Dec. 11, 2007 |
| ROHDE & SCHWARZ Spectrum Analyzer | FSP 40 | 100036 | Mar. 14, 2007 | Mar. 13, 2008 |

**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 horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in ADT Chamber No. 6.
4. The Industry Canada Reference No. IC 3789-6.

## 4.2.3 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

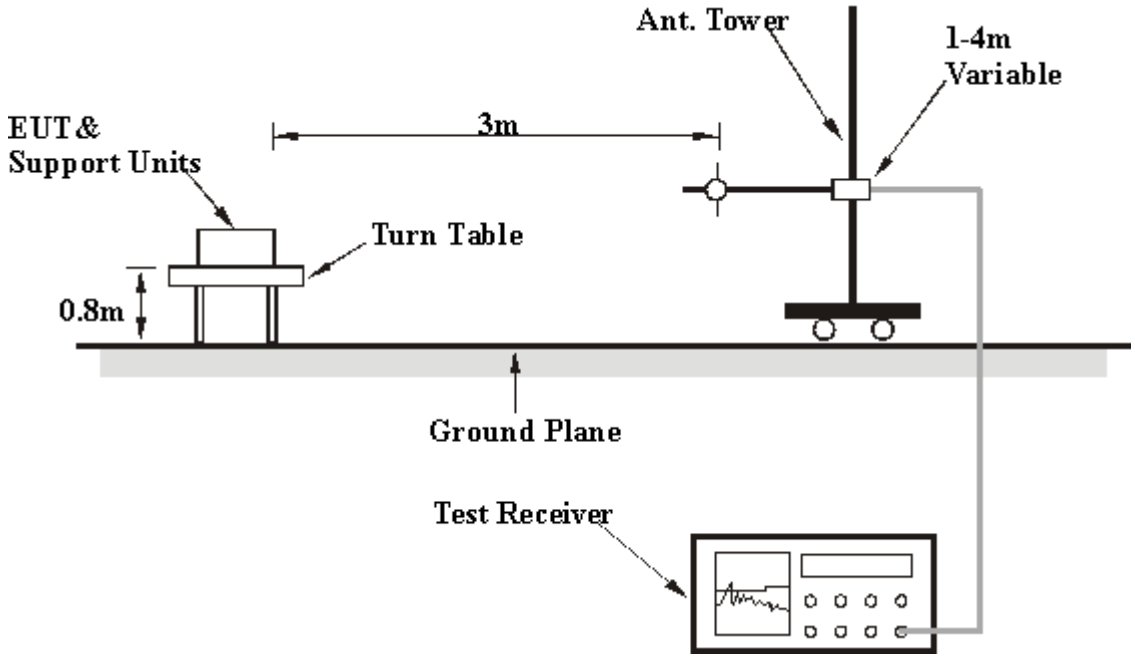
**NOTE:**

1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection 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.

## 4.2.4 DEVIATION FROM TEST STANDARD

No deviation

## 4.2.5 TEST SETUP




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

## 4.2.6 EUT OPERATING CONDITIONS

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

## 4.2.7 TEST RESULTS

**RADIATED WORST CASE DATA: FOR GFSK (BELOW 1GHz)**

| | | | |
|---|---|---|---|
| **TEST MODE** | Mode A | | |
| **MODULATION TYPE** | GFSK | **CHANNEL** | 78 |
| **INPUT POWER** | 3.7Vdc | **FREQUENCY RANGE** | Below 1000MHz |
| **ENVIRONMENTAL CONDITIONS** | 24deg. C, 62%RH, 995hPa | **DETECTOR FUNCTION** | Quasi-Peak |
| **TESTED BY** | Jun Wu | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No. | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 615.110 | 29.92 QP | 46.00 | -16.08 | 1.36 H | 289 | 5.25 | 24.67 |
| 2 | 644.269 | 32.71 QP | 46.00 | -13.29 | 1.28 H | 283 | 7.78 | 24.93 |
| 3 | 683.146 | 32.46 QP | 46.00 | -13.54 | 1.21 H | 277 | 6.96 | 25.50 |
| 4 | 696.754 | 31.32 QP | 46.00 | -14.68 | 1.26 H | 277 | 5.61 | 25.71 |
| 5 | 731.743 | 29.74 QP | 46.00 | -16.26 | 1.14 H | 283 | 2.55 | 27.19 |
| 6 | 856.152 | 29.53 QP | 46.00 | -16.47 | 1.20 H | 253 | 0.66 | 28.87 |
| 7 | 895.030 | 29.85 QP | 46.00 | -16.15 | 1.08 H | 238 | 0.39 | 29.46 |
| 8 | 935.852 | 30.21 QP | 46.00 | -15.79 | 1.12 H | 241 | 0.28 | 29.93 |
| 9 | 957.234 | 31.36 QP | 46.00 | -14.64 | 1.02 H | 253 | 1.24 | 30.12 |

| 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 | 53.327 | 24.69 QP | 40.00 | -15.31 | 1.00 V | 295 | 10.22 | 14.47 |
| 2 | 105.812 | 25.22 QP | 43.50 | -18.28 | 1.00 V | 244 | 15.00 | 10.22 |
| 3 | 653.988 | 27.59 QP | 46.00 | -18.41 | 1.14 V | 205 | 2.55 | 25.04 |
| 4 | 669.539 | 27.95 QP | 46.00 | -18.05 | 1.05 V | 196 | 2.67 | 25.28 |
| 5 | 883.367 | 27.68 QP | 46.00 | -18.32 | 1.19 V | 49 | -1.61 | 29.29 |
| 6 | 933.908 | 28.36 QP | 46.00 | -17.64 | 1.28 V | 202 | -1.55 | 29.91 |

**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.

## RADIATED DATA: FOR GFSK (ABOVE 1GHz)

| | | | |
|---|---|---|---|
| **TEST MODE** | Mode A | | |
| **MODULATION TYPE** | GFSK | **CHANNEL** | 0 |
| **INPUT POWER** | 3.7Vdc | **FREQUENCY RANGE** | 1 ~ 25GHz |
| **ENVIRONMENTAL CONDITIONS** | 25 deg. C, 62%RH, 995hPa | **DETECTOR FUNCTION** | Peak (PK)<br>Average (AV) |
| **TESTED BY** | Jun Wu | | |

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

| No. | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
|---|---|---|---|---|---|---|---|---|
| 1 | 1602.000 | 47.51 PK | 74.00 | -26.49 | 1.08 H | 66 | 15.42 | 32.09 |
| 2 | 1602.000 | 43.42 AV | 54.00 | -10.58 | 1.08 H | 66 | 11.33 | 32.09 |
| 3 | 2376.000 | 60.76 PK | 74.00 | -13.24 | 1.30 H | 82 | 26.37 | 34.39 |
| 4 | 2376.000 | 30.66 AV | 54.00 | -23.34 | 1.30 H | 82 | -3.73 | 34.39 |
| 5 | *2402.000 | 90.54 PK | | | 1.30 H | 82 | 56.10 | 34.44 |
| 6 | *2402.000 | 60.44 AV | | | 1.30 H | 82 | 26.00 | 34.44 |
| 7 | 4804.000 | 67.25 PK | 74.00 | -6.75 | 1.04 H | 326 | 25.86 | 41.39 |
| 8 | 4804.000 | 37.15 AV | 54.00 | -16.85 | 1.04 H | 326 | -4.24 | 41.39 |

**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 | 1602.000 | 52.67 PK | 74.00 | -21.33 | 1.28 V | 4 | 20.58 | 32.09 |
| 2 | 1602.000 | 50.62 AV | 54.00 | -3.38 | 1.28 V | 4 | 18.53 | 32.09 |
| 3 | 2376.000 | 61.08 PK | 74.00 | -12.92 | 1.00 V | 42 | 26.69 | 34.39 |
| 4 | 2376.000 | 30.98 AV | 54.00 | -23.02 | 1.00 V | 42 | -3.41 | 34.39 |
| 5 | *2402.000 | 85.65 PK | | | 1.00 V | 42 | 51.21 | 34.44 |
| 6 | *2402.000 | 55.55 AV | | | 1.00 V | 42 | 21.11 | 34.44 |
| 7 | 4804.000 | 66.78 PK | 74.00 | -7.22 | 1.09 V | 105 | 25.39 | 41.39 |
| 8 | 4804.000 | 36.68 AV | 54.00 | -17.32 | 1.09 V | 105 | -4.71 | 41.39 |

**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. 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)= -30.1 dB.
6. Average value = peak reading + 20log(duty cycle).

| | | | |
|---|---|---|---|
| **TEST MODE** | Mode A | | |
| **MODULATION TYPE** | GFSK | **CHANNEL** | 39 |
| **INPUT POWER** | 3.7Vdc | **FREQUENCY RANGE** | 1 ~ 25GHz |
| **ENVIRONMENTAL CONDITIONS** | 25 deg. C, 62%RH, 995hPa | **DETECTOR FUNCTION** | Peak (PK)<br>Average (AV) |
| **TESTED BY** | Jun Wu | | |

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

| No. | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
|---|---|---|---|---|---|---|---|---|
| 1 | 1628.000 | 49.02 PK | 74.00 | -24.98 | 1.22 H | 177 | 16.83 | 32.19 |
| 2 | 1628.000 | 44.28 AV | 54.00 | -9.72 | 1.22 H | 177 | 12.09 | 32.19 |
| 3 | *2441.000 | 90.09 PK | | | 1.00 H | 319 | 55.57 | 34.52 |
| 4 | *2441.000 | 59.99 AV | | | 1.00 H | 319 | 25.47 | 34.52 |
| 5 | 4882.000 | 70.53 PK | 74.00 | -3.47 | 1.20 H | 312 | 28.93 | 41.60 |
| 6 | 4882.000 | 40.43 AV | 54.00 | -13.57 | 1.20 H | 312 | -1.17 | 41.60 |

**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 | 1628.000 | 51.99 PK | 74.00 | -22.01 | 1.26 V | 202 | 19.80 | 32.19 |
| 2 | 1628.000 | 49.48 AV | 54.00 | -4.52 | 1.26 V | 202 | 17.29 | 32.19 |
| 3 | *2441.000 | 85.74 PK | | | 1.00 V | 7 | 51.22 | 34.52 |
| 4 | *2441.000 | 55.64 AV | | | 1.00 V | 7 | 21.12 | 34.52 |
| 5 | 4882.000 | 72.30 PK | 74.00 | -1.70 | 1.00 V | 226 | 30.70 | 41.60 |
| 6 | 4882.000 | 42.20 AV | 54.00 | -11.80 | 1.00 V | 226 | 0.60 | 41.60 |

**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.
5. 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)= -30.1 dB.
6. Average value = peak reading + 20log(duty cycle).

| | | | |
|---|---|---|---|
| **TEST MODE** | Mode A | | |
| **MODULATION TYPE** | GFSK | **CHANNEL** | 78 |
| **INPUT POWER** | 3.7Vdc | **FREQUENCY RANGE** | 1 ~ 25GHz |
| **ENVIRONMENTAL CONDITIONS** | 25 deg. C, 62%RH, 995hPa | **DETECTOR FUNCTION** | Peak (PK)<br>Average (AV) |
| **TESTED BY** | Jun Wu | | |

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

| No. | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
|---|---|---|---|---|---|---|---|---|
| 1 | 1654.000 | 48.05 PK | 74.00 | -25.95 | 1.05 H | 66 | 15.76 | 32.29 |
| 2 | 1654.000 | 42.93 AV | 54.00 | -11.07 | 1.05 H | 66 | 10.64 | 32.29 |
| 3 | *2480.000 | 91.47 PK | | | 1.20 H | 88 | 56.87 | 34.60 |
| 4 | *2480.000 | 61.37 AV | | | 1.20 H | 88 | 26.77 | 34.60 |
| 5 | 2483.500 | 68.36 PK | 74.00 | -5.64 | 1.20 H | 88 | 33.75 | 34.61 |
| 6 | 2483.500 | 38.26 AV | 54.00 | -15.74 | 1.20 H | 88 | 3.65 | 34.61 |
| **7** | **4960.000** | **72.88 PK** | **74.00** | **-1.12** | **1.07 H** | **85** | **31.08** | **41.80** |
| 8 | 4960.000 | 42.78 AV | 54.00 | -11.22 | 1.07 H | 85 | 0.98 | 41.80 |

**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 | 1654.000 | 49.55 PK | 74.00 | -24.45 | 1.17 V | 62 | 17.26 | 32.29 |
| 2 | 1654.000 | 40.67 AV | 54.00 | -13.33 | 1.17 V | 62 | 8.38 | 32.29 |
| 3 | *2480.000 | 86.59 PK | | | 1.42 V | 351 | 51.99 | 34.60 |
| 4 | *2480.000 | 56.49 AV | | | 1.42 V | 351 | 21.89 | 34.60 |
| 5 | 2483.500 | 62.00 PK | 74.00 | -12.00 | 1.42 V | 62 | 27.39 | 34.61 |
| 6 | 2483.500 | 31.90 AV | 54.00 | -22.10 | 1.42 V | 62 | -2.71 | 34.61 |
| 7 | 4960.000 | 69.06 PK | 74.00 | -4.94 | 1.00 V | 344 | 27.26 | 41.80 |
| 8 | 4960.000 | 38.96 AV | 54.00 | -15.04 | 1.00 V | 344 | -2.84 | 41.80 |

**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. 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)= -30.1 dB.
6. Average value = peak reading + 20log(duty cycle).

## RADIATED DATA: MODE A FOR 8DPSK (ABOVE 1GHz)

| | | | |
|---|---|---|---|
| **TEST MODE** | Mode A | | |
| **MODULATION TYPE** | 8DPSK | **CHANNEL** | 0 |
| **INPUT POWER** | 3.7Vdc | **FREQUENCY RANGE** | 1 ~ 25GHz |
| **ENVIRONMENTAL CONDITIONS** | 24 deg. C, 62%RH, 995hPa | **DETECTOR FUNCTION** | Peak (PK)<br>Average (AV) |
| **TESTED BY** | Jun Wu | | |

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

| No. | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
|---|---|---|---|---|---|---|---|---|
| 1 | 1602.000 | 47.92 PK | 74.00 | -26.08 | 1.18 H | 179 | 15.83 | 32.09 |
| 2 | 1602.000 | 42.87 AV | 54.00 | -11.13 | 1.18 H | 179 | 10.78 | 32.09 |
| 3 | 2376.000 | 59.03 PK | 74.00 | -14.97 | 1.27 H | 270 | 24.64 | 34.39 |
| 4 | 2376.000 | 28.93 AV | 54.00 | -25.07 | 1.27 H | 270 | -5.46 | 34.39 |
| 5 | *2402.000 | 91.19 PK | | | 1.27 H | 270 | 56.75 | 34.44 |
| 6 | *2402.000 | 61.09 AV | | | 1.27 H | 270 | 26.65 | 34.44 |
| 7 | 4804.000 | 61.28 PK | 74.00 | -12.72 | 1.41 H | 252 | 19.89 | 41.39 |
| 8 | 4804.000 | 31.18 AV | 54.00 | -22.82 | 1.41 H | 252 | -10.21 | 41.39 |

**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 | 1602.000 | 49.28 PK | 74.00 | -24.72 | 1.24 V | 243 | 17.19 | 32.09 |
| 2 | 1602.000 | 44.77 AV | 54.00 | -9.23 | 1.24 V | 243 | 12.68 | 32.09 |
| 3 | 2376.000 | 58.83 PK | 74.00 | -15.17 | 1.26 V | 226 | 24.44 | 34.39 |
| 4 | 2376.000 | 28.73 AV | 54.00 | -25.27 | 1.26 V | 226 | -5.66 | 34.39 |
| 5 | *2402.000 | 87.42 PK | | | 1.26 V | 226 | 52.98 | 34.44 |
| 6 | *2402.000 | 57.32 AV | | | 1.26 V | 226 | 22.88 | 34.44 |
| 7 | 4804.000 | 60.85 PK | 74.00 | -13.15 | 1.33 V | 228 | 19.46 | 41.39 |
| 8 | 4804.000 | 30.75 AV | 54.00 | -23.25 | 1.33 V | 228 | -10.64 | 41.39 |

**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. 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)= -30.1 dB.
6. Average value = peak reading + 20log(duty cycle).

| | | | |
|---|---|---|---|
| **TEST MODE** | Mode A | | |
| **MODULATION TYPE** | 8DPSK | **CHANNEL** | 39 |
| **INPUT POWER** | 3.7Vdc | **FREQUENCY RANGE** | 1 ~ 25GHz |
| **ENVIRONMENTAL CONDITIONS** | 24 deg. C, 62%RH, 995hPa | **DETECTOR FUNCTION** | Peak (PK)<br>Average (AV) |
| **TESTED BY** | Jun Wu | | |

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

| No. | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
|---|---|---|---|---|---|---|---|---|
| 1 | 1628.000 | 49.43 PK | 74.00 | -24.57 | 1.69 H | 261 | 17.24 | 32.19 |
| 2 | 1628.000 | 44.45 AV | 54.00 | -9.55 | 1.69 H | 261 | 12.26 | 32.19 |
| 3 | *2441.000 | 87.31 PK | | | 1.20 H | 269 | 52.79 | 34.52 |
| 4 | *2441.000 | 57.21 AV | | | 1.20 H | 269 | 22.69 | 34.52 |
| 5 | 4882.000 | 64.40 PK | 74.00 | -9.60 | 1.38 H | 251 | 22.80 | 41.60 |
| 6 | 4882.000 | 34.30 AV | 54.00 | -19.70 | 1.38 H | 251 | -7.30 | 41.60 |

**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 | 1628.000 | 48.41 PK | 74.00 | -25.59 | 1.15 V | 242 | 16.22 | 32.19 |
| 2 | 1628.000 | 44.27 AV | 54.00 | -9.73 | 1.15 V | 242 | 12.08 | 32.19 |
| 3 | *2441.000 | 82.09 PK | | | 1.24 V | 211 | 47.57 | 34.52 |
| 4 | *2441.000 | 51.99 AV | | | 1.24 V | 211 | 17.47 | 34.52 |
| 5 | 4882.000 | 62.93 PK | 74.00 | -11.07 | 1.04 V | 228 | 21.33 | 41.60 |
| 6 | 4882.000 | 32.83 AV | 54.00 | -21.17 | 1.04 V | 228 | -8.77 | 41.60 |

**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.
5. 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)= -30.1dB.
6. Average value = peak reading + 20log(duty cycle).

| | | | |
|---|---|---|---|
| **TEST MODE** | Mode A | | |
| **MODULATION TYPE** | 8DPSK | **CHANNEL** | 78 |
| **INPUT POWER** | 3.7Vdc | **FREQUENCY RANGE** | 1 ~ 25GHz |
| **ENVIRONMENTAL CONDITIONS** | 24 deg. C, 62%RH, 995hPa | **DETECTOR FUNCTION** | Peak (PK)<br>Average (AV) |
| **TESTED BY** | Jun Wu | | |

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

| No. | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
|---|---|---|---|---|---|---|---|---|
| 1 | 1654.000 | 49.51 PK | 74.00 | -24.49 | 1.20 H | 166 | 17.22 | 32.29 |
| 2 | 1654.000 | 45.26 AV | 54.00 | -8.74 | 1.20 H | 166 | 12.97 | 32.29 |
| 3 | *2480.000 | 87.85 PK | | | 1.19 H | 272 | 53.25 | 34.60 |
| 4 | *2480.000 | 57.75 AV | | | 1.19 H | 272 | 23.15 | 34.60 |
| 5 | 2483.500 | 68.39 PK | 74.00 | -5.61 | 1.19 H | 272 | 33.78 | 34.61 |
| 6 | 2483.500 | 38.29 AV | 54.00 | -15.71 | 1.19 H | 272 | 3.68 | 34.61 |
| 7 | 4960.000 | 64.60 PK | 74.00 | -9.40 | 1.37 H | 252 | 22.80 | 41.80 |
| 8 | 4960.000 | 34.50 AV | 54.00 | -19.50 | 1.37 H | 252 | -7.30 | 41.80 |

**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 | 1654.000 | 47.98 PK | 74.00 | -26.02 | 1.19 V | 217 | 15.69 | 32.29 |
| 2 | 1654.000 | 42.75 AV | 54.00 | -11.25 | 1.19 V | 217 | 10.46 | 32.29 |
| 3 | *2480.000 | 83.53 PK | | | 1.45 V | 229 | 48.93 | 34.60 |
| 4 | *2480.000 | 53.43 AV | | | 1.45 V | 229 | 18.83 | 34.60 |
| 5 | 2483.500 | 60.34 PK | 74.00 | -13.66 | 1.45 V | 229 | 25.73 | 34.61 |
| 6 | 2483.500 | 30.24 AV | 54.00 | -23.76 | 1.45 V | 229 | -4.37 | 34.61 |
| 7 | 4960.000 | 63.26 PK | 74.00 | -10.74 | 1.03 V | 227 | 21.46 | 41.80 |
| 8 | 4960.000 | 33.16 AV | 54.00 | -20.84 | 1.03 V | 227 | -8.64 | 41.80 |

**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. 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)= -30.1 dB.
6. Average value = peak reading + 20log(duty cycle).

## 4.3 NUMBER OF HOPPING FREQUENCY USED

### 4.3.1 LIMIT OF HOPPING FREQUENCY USED

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

### 4.3.2 TEST INSTRUMENTS

| Description & Manufacturer | Model No. | Serial No. | Calibrated Date | Calibrated Until |
|---|---|---|---|---|
| SPECTRUM ANALYZER | FSP 40 | 100036 | Mar. 14, 2007 | Mar. 13, 2008 |

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

### 4.3.3 TEST PROCEDURES

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

b. 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.

c. 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.

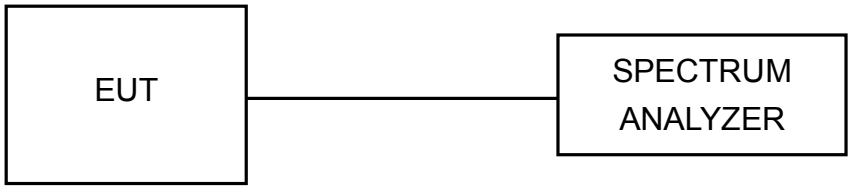
d. Set the SA on View mode and then plot the result on SA screen.

e. Repeat above procedures until all frequencies measured were complete.

## 4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

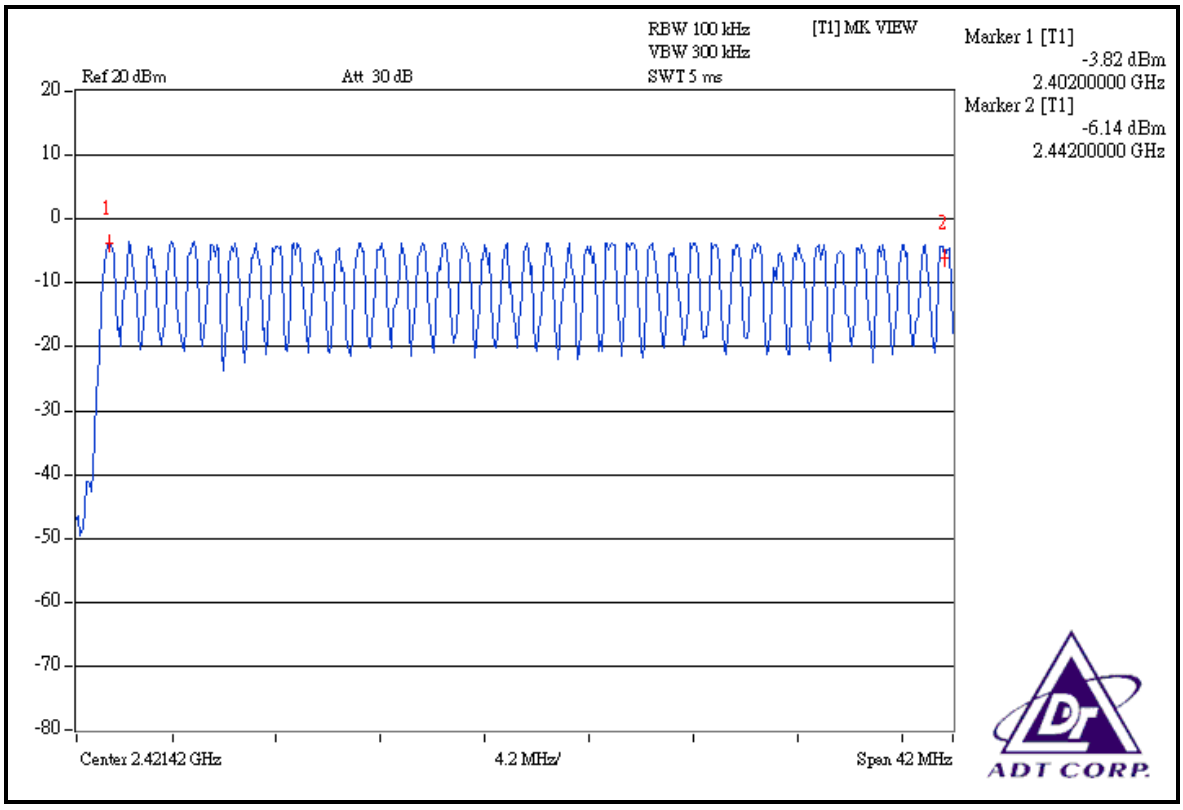
## 4.3.5 TEST SETUP

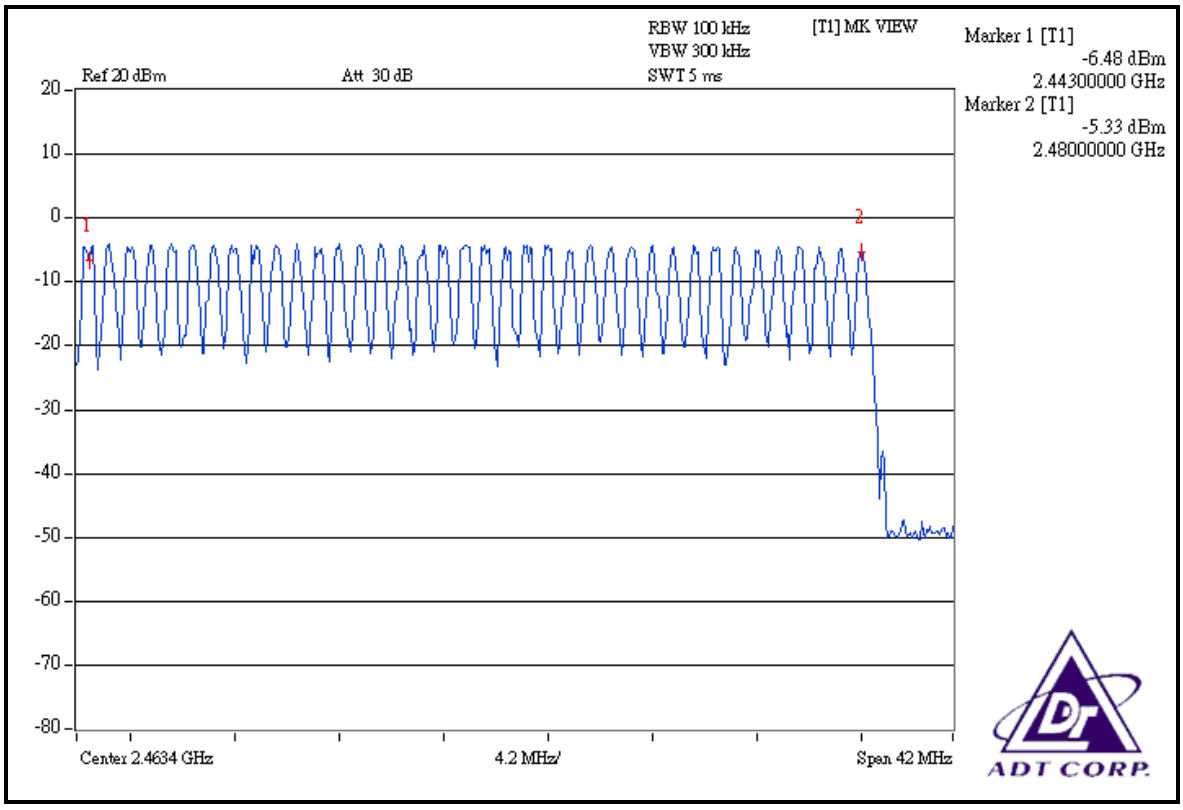



## 4.3.6 TEST RESULTS

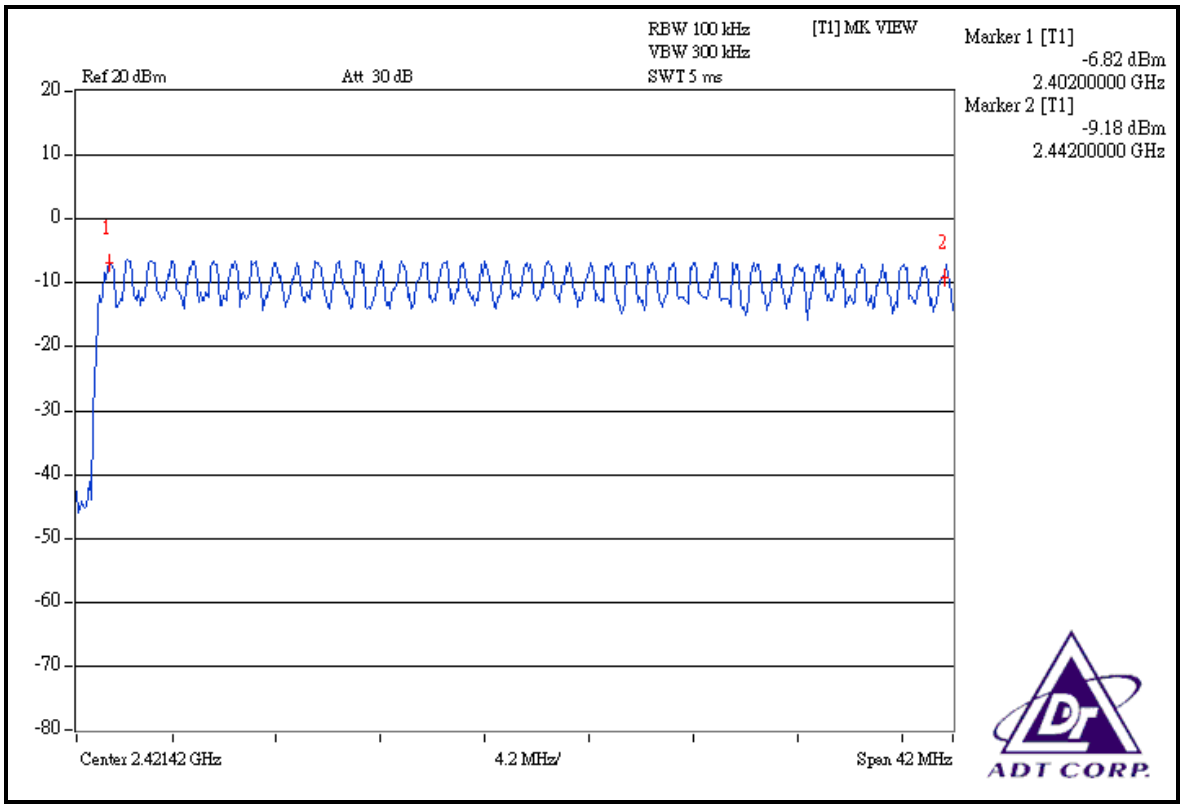
There are 79 hopping frequencies in the hopping mode. Please refer to next two pages for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

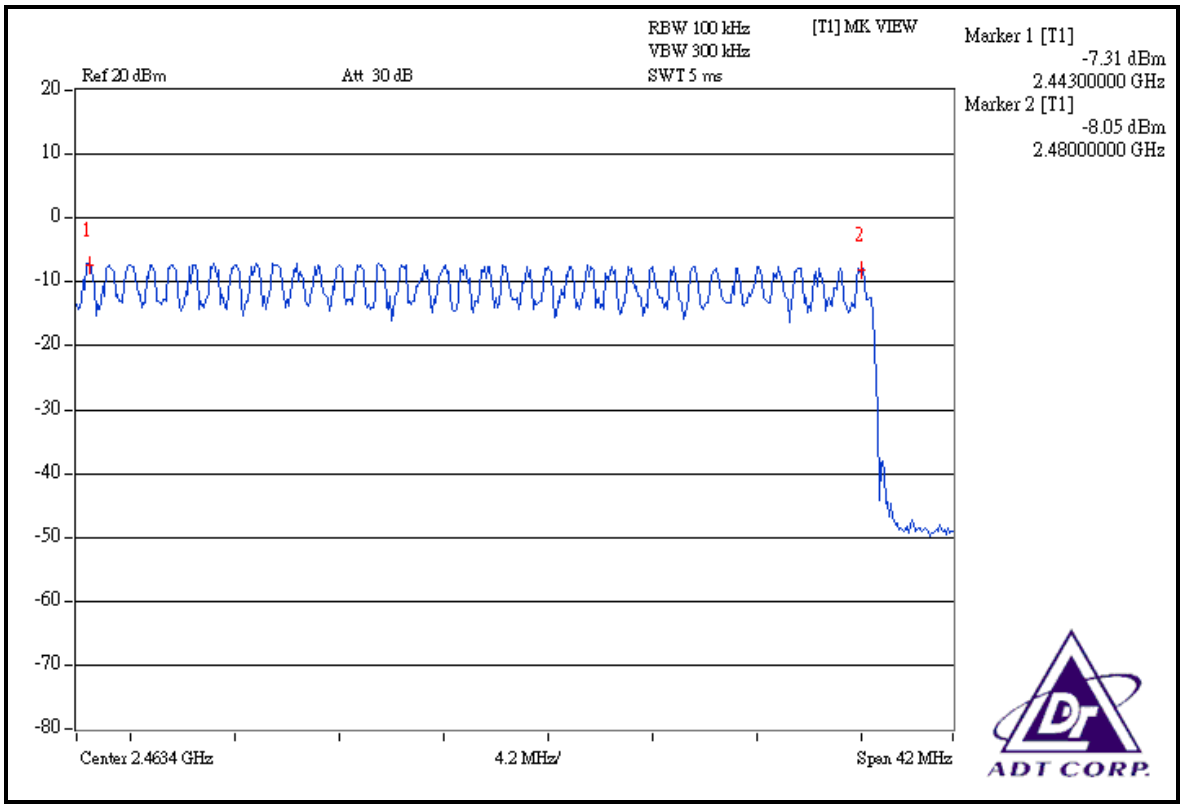
## Mode A: FOR GFSK



## Mode A: FOR 8DPSK



## 4.4 DWELL TIME ON EACH CHANNEL

### 4.4.1 LIMIT OF DWELL TIME USED

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

### 4.4.2 TEST INSTRUMENTS

| Description & Manufacturer | Model No. | Serial No. | Calibrated Date | Calibrated Until |
|---|---|---|---|---|
| SPECTRUM ANALYZER | FSP 40 | 100036 | Mar. 14, 2007 | Mar. 13, 2008 |

**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 PROCEDURES

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

b. 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.

c. 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.

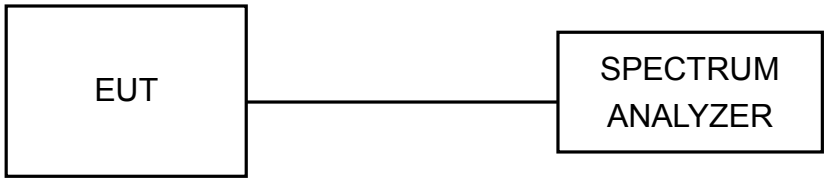
d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.

e. Repeat above procedures until all different time-slot modes have been completed.

### 4.4.4 DEVIATION FROM TEST STANDARD

No deviation.

## 4.4.5 TEST SETUP



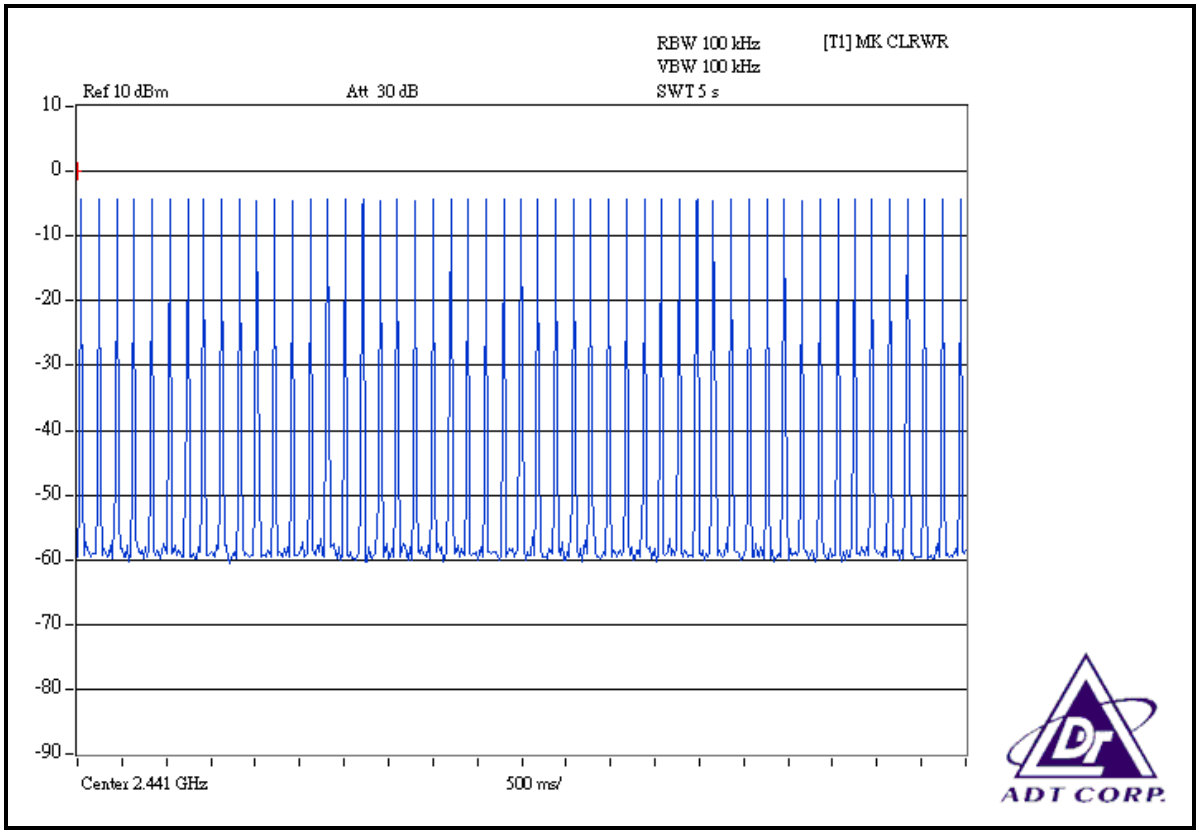

## 4.4.6 TEST RESULTS

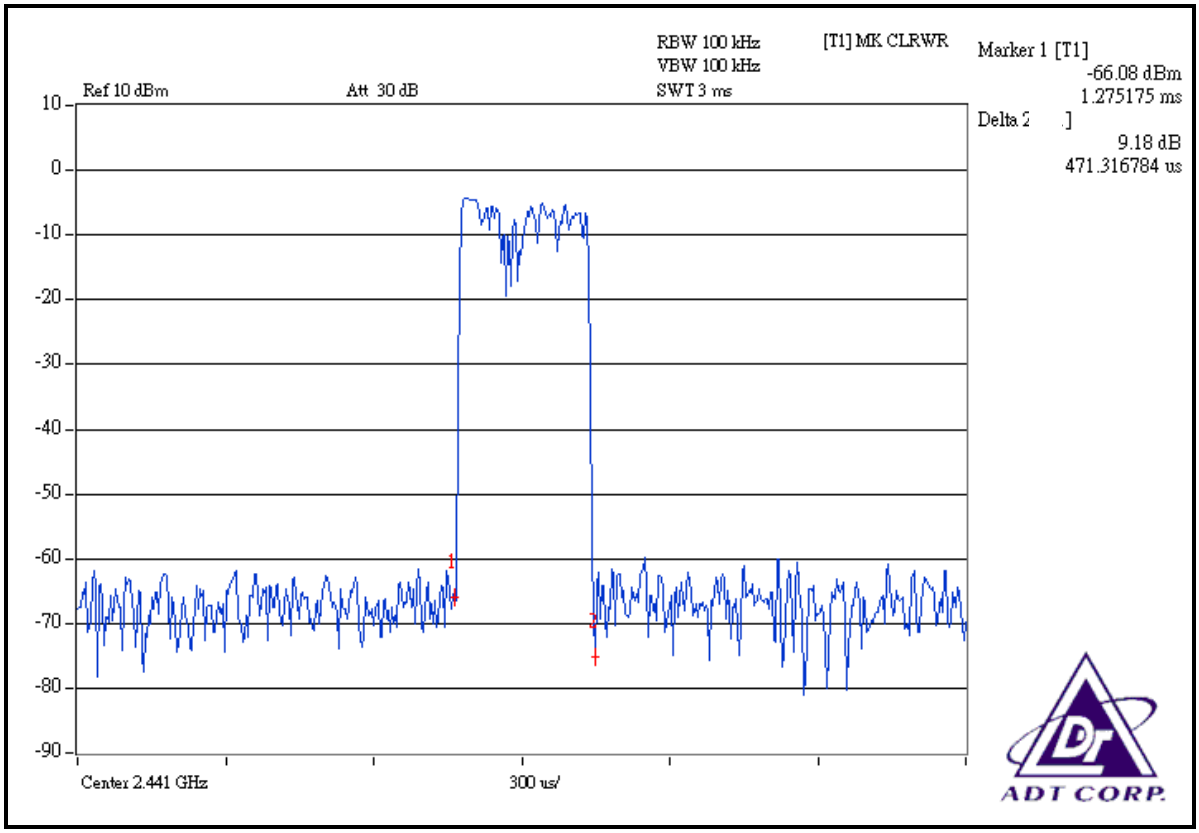
**Mode A: FOR GFSK**

| Mode | Number of transmission in a 31.6 (79Hopping*0.4) | Length of transmission time (msec) | Result (msec) | Limit (msec) |
|---|---|---|---|---|
| DH1 | 51 (times / 5 sec) *6.32=322.32 times | 0.471 | 151.813 | 400 |
| DH3 | 25 (times / 5 sec) *6.32=158.00 times | 1.740 | 274.920 | 400 |
| DH5 | 17 (times / 5 sec) *6.32=107.44 times | 3.003 | 322.642 | 400 |

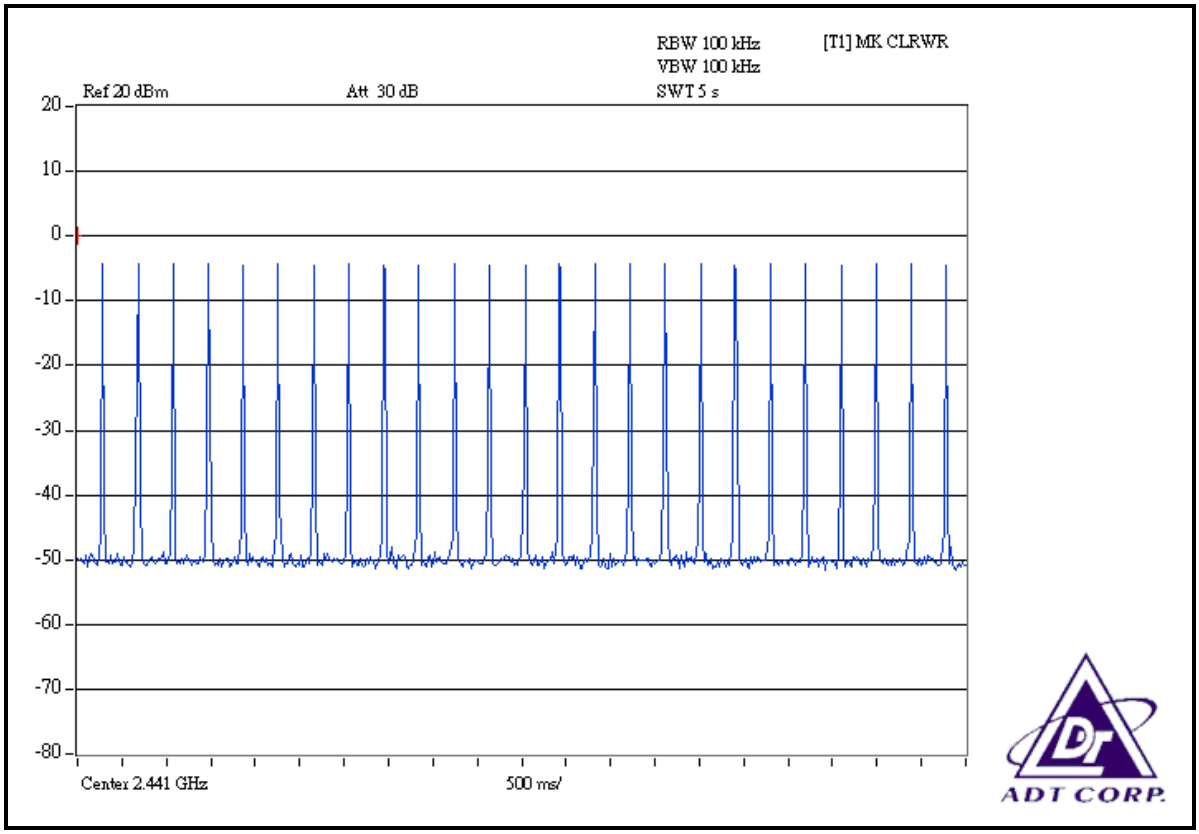
**NOTE:** Test plots of the transmitting time slot are shown on next 3 pages.

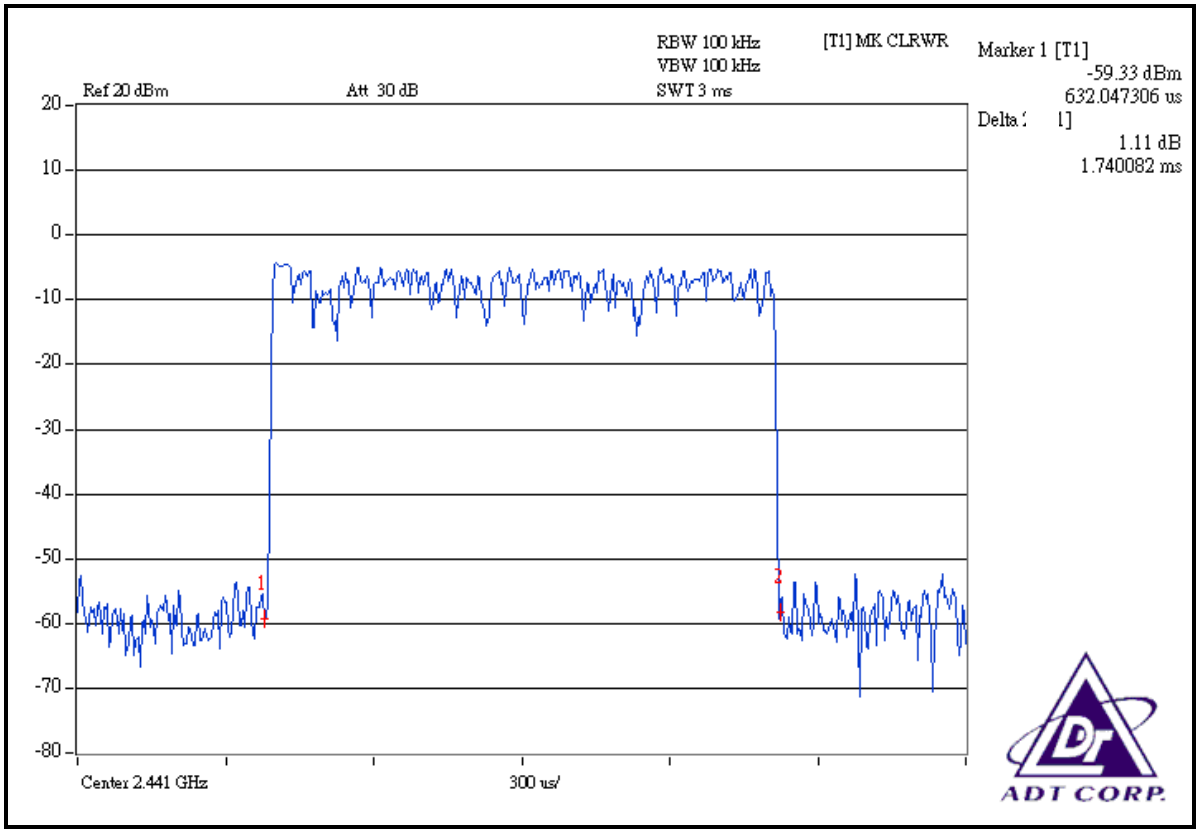
**DH1**


RBW 100 kHz
VBW 100 kHz
SWT 5 s
[T1] MK CLRWR
Ref 10 dBm
Att 30 dB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.441 GHz
500 ms/
ADT CORP.

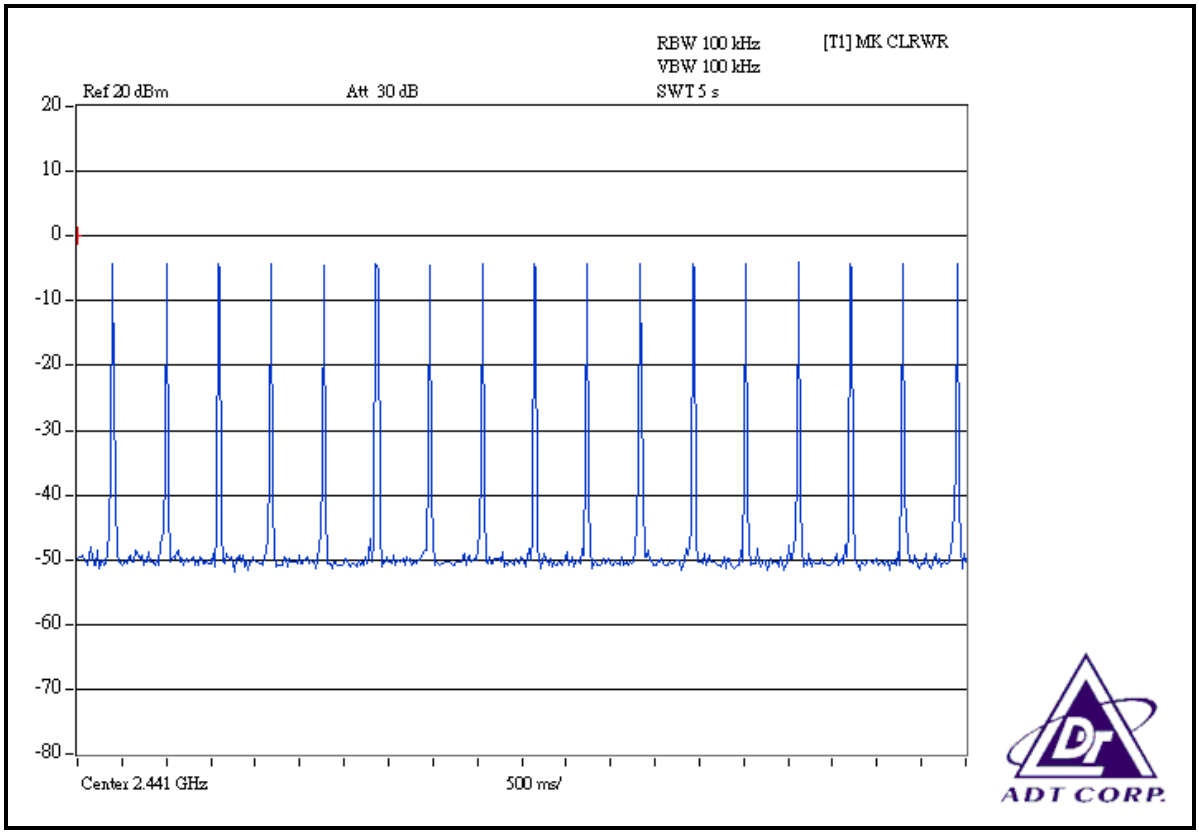

RBW 100 kHz
VBW 100 kHz
SWT 3 ms
[T1] MK CLRWR
Marker 1 [T1]
-66.08 dBm
1.275175 ms
Delta 2 .]
9.18 dB
471.316784 us
Ref 10 dBm
Att 30 dB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.441 GHz
300 us/
ADT CORP.

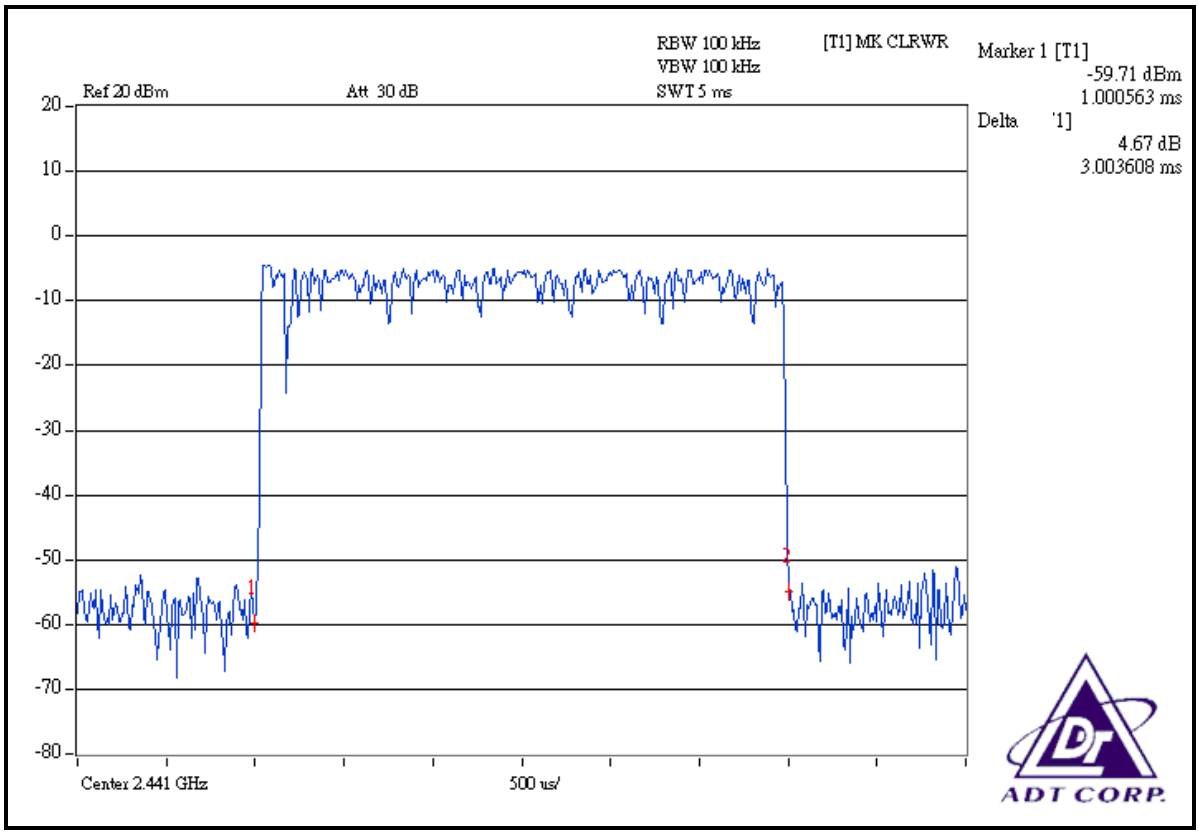
**DH3**


RBW 100 kHz
VBW 100 kHz
SWT 5 s
[T1] MK CLRWR
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.441 GHz
500 ms/
ADT CORP.


RBW 100 kHz
VBW 100 kHz
SWT 3 ms
[T1] MK CLRWR
Marker 1 [T1]
-59.33 dBm
632.047306 us
Delta [1]
1.11 dB
1.740082 ms
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.441 GHz
300 us/
ADT CORP.

## DH5


RBW 100 kHz
VBW 100 kHz
SWT 5 s
[T1] MK CLRWR
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.441 GHz
500 ms/
ADT CORP.

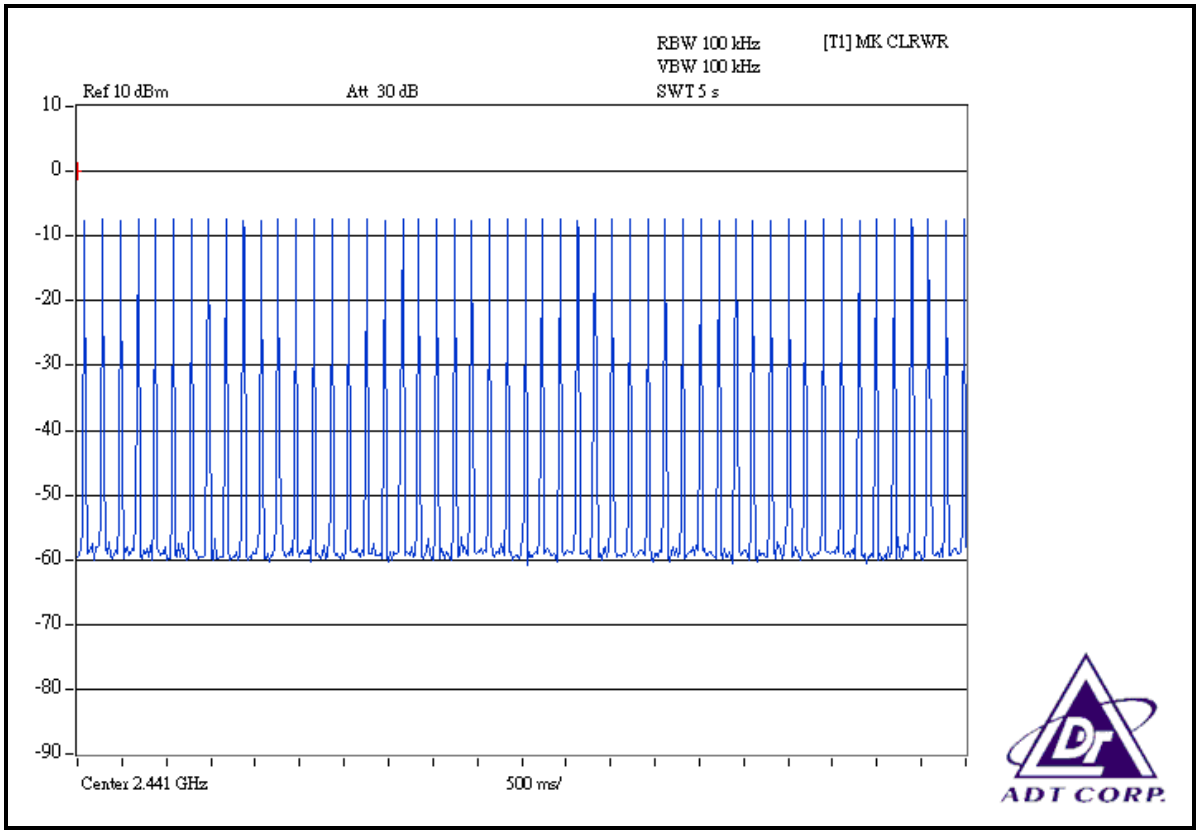

RBW 100 kHz
VBW 100 kHz
SWT 5 ms
[T1] MK CLRWR
Marker 1 [T1]
-59.71 dBm
1.000563 ms
Delta '1]
4.67 dB
3.003608 ms
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.441 GHz
500 us/
ADT CORP.

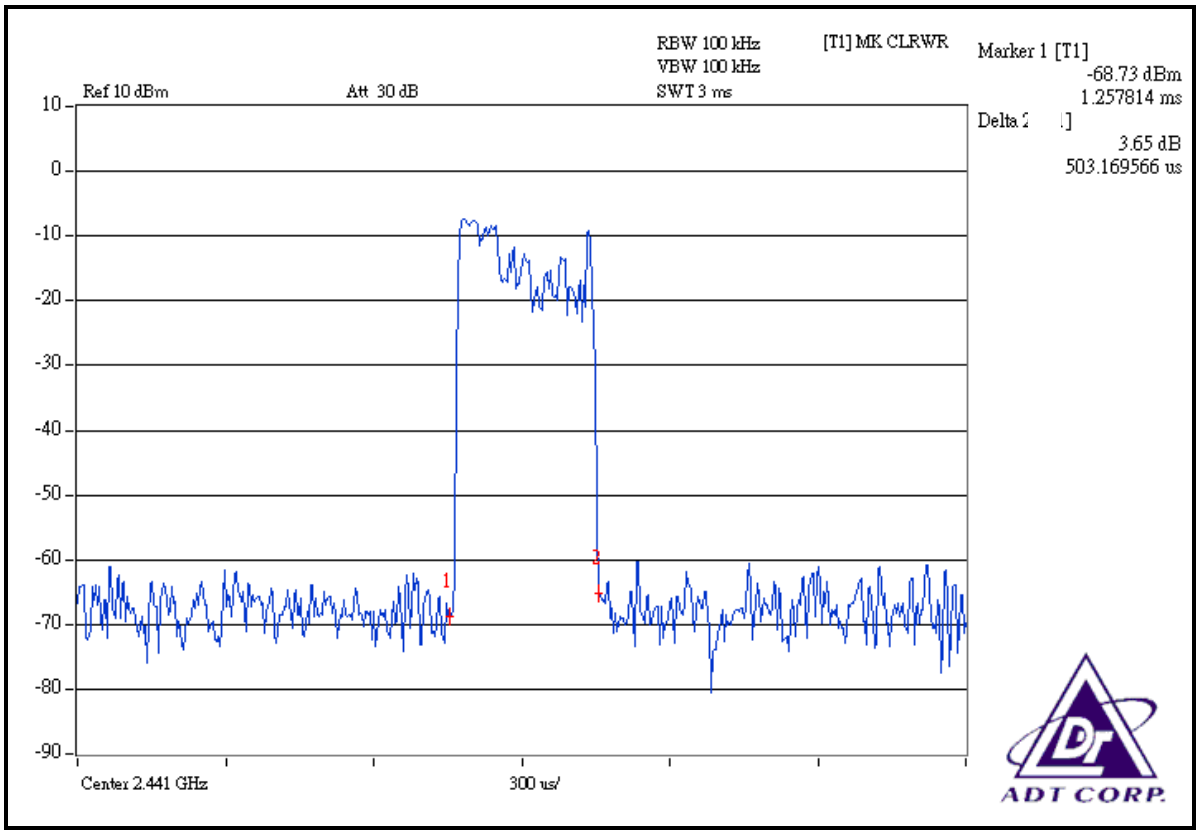
**Mode A: FOR 8DPSK**

| Mode | Number of transmission in a 31.6 (79Hopping*0.4) | Length of transmission time (msec) | Result (msec) | Limit (msec) |
|---|---|---|---|---|
| DH1 | 51 (times / 5 sec) *6.32=322.32 times | 0.503 | 162.127 | 400 |
| DH3 | 25 (times / 5 sec) *6.32=158.00 times | 1.745 | 275.710 | 400 |
| DH5 | 17 (times / 5 sec) *6.32=107.44 times | 3.025 | 325.006 | 400 |

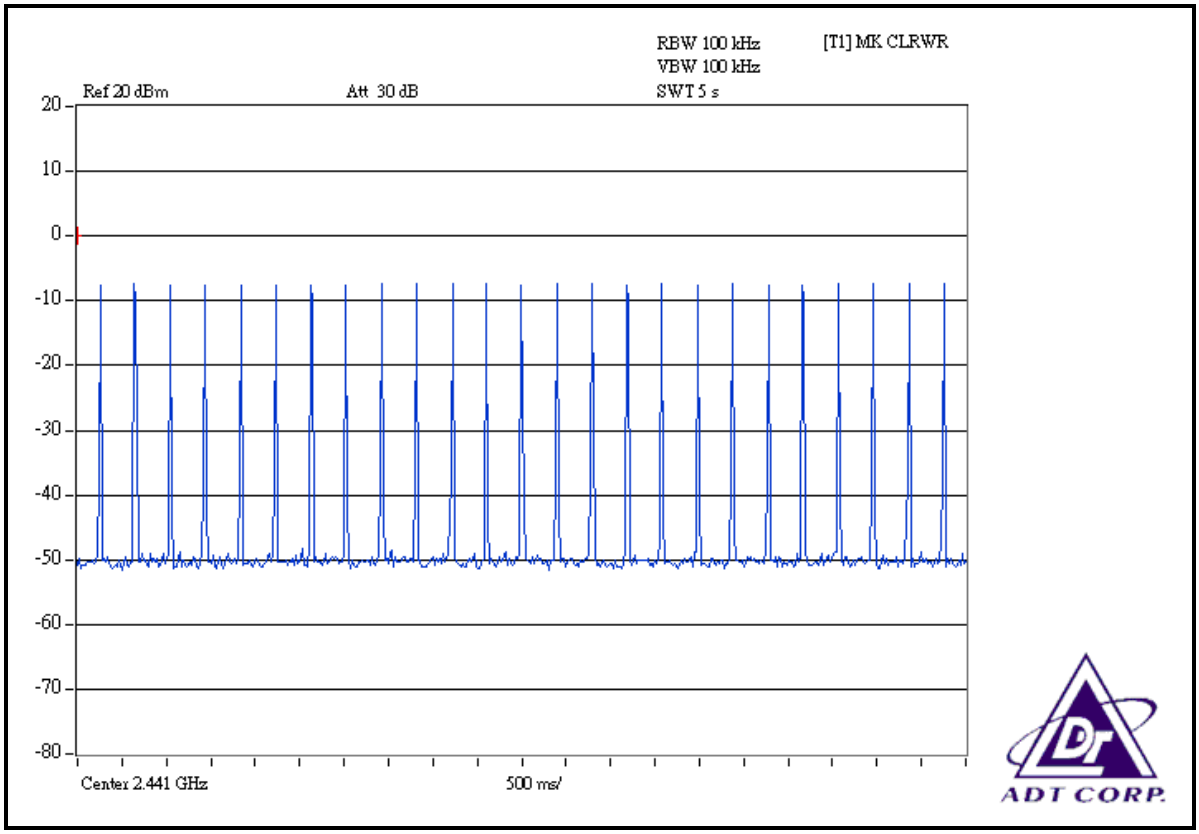
**NOTE:** Test plots of the transmitting time slot are shown on next 3 pages.

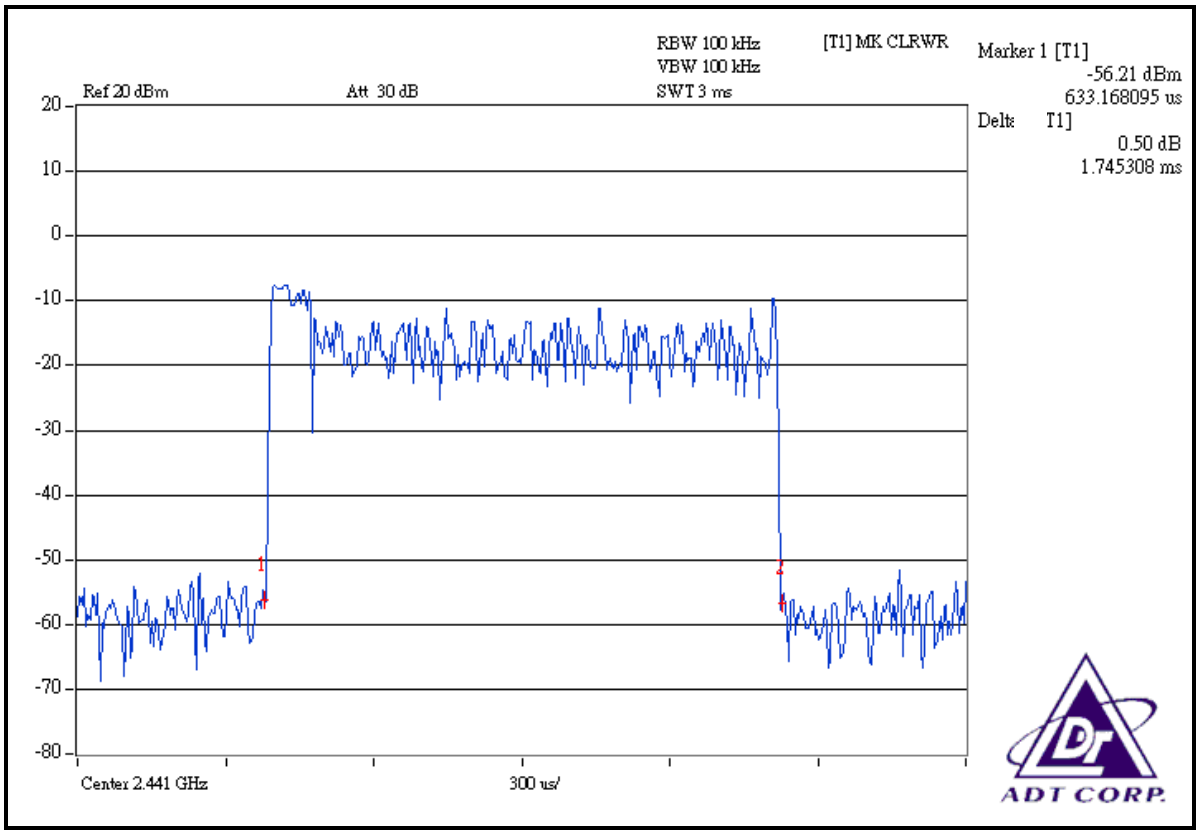
**DH1**


RBW 100 kHz
VBW 100 kHz
SWT 5 s
[T1] MK CLRWR
Ref 10 dBm
Att 30 dB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.441 GHz
500 ms/
ADT CORP.

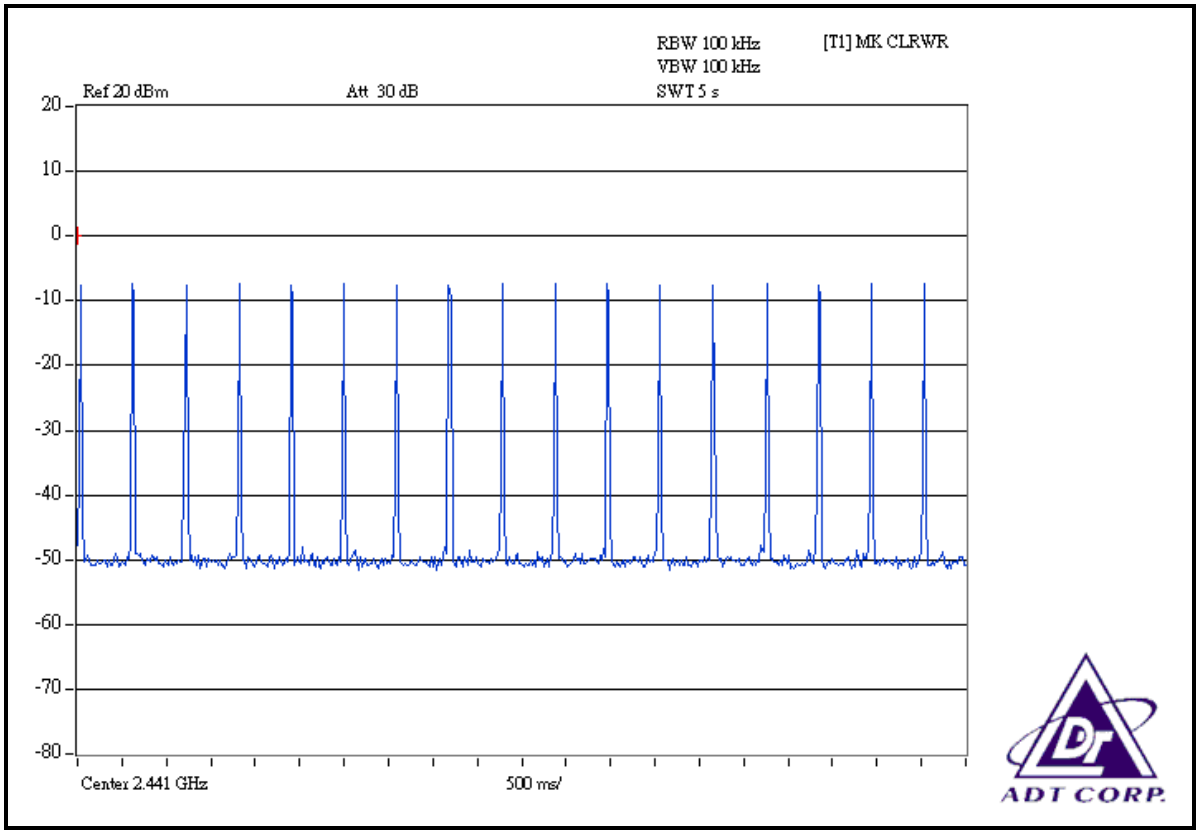

RBW 100 kHz
VBW 100 kHz
SWT 3 ms
[T1] MK CLRWR
Marker 1 [T1]
-68.73 dBm
1.257814 ms
Delta 2 [
3.65 dB
503.169566 us
Ref 10 dBm
Att 30 dB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.441 GHz
300 us/
ADT CORP.

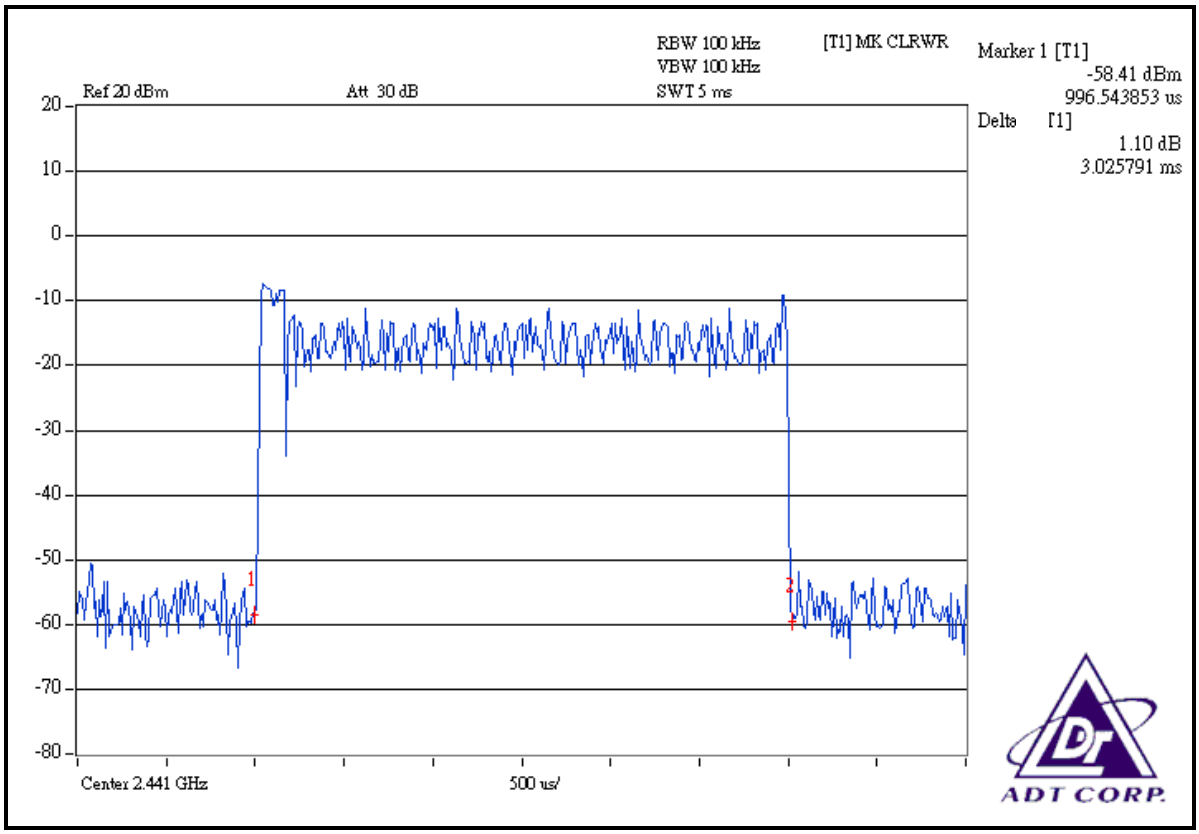
**DH3**


RBW 100 kHz
VBW 100 kHz
SWT 5 s
[T1] MK CLRWR
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.441 GHz
500 ms/
ADT CORP.


RBW 100 kHz
VBW 100 kHz
SWT 3 ms
[T1] MK CLRWR
Marker 1 [T1]
-56.21 dBm
633.168095 us
Delta [T1]
0.50 dB
1.745308 ms
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.441 GHz
300 us/
ADT CORP.

## DH5


RBW 100 kHz
VBW 100 kHz
SWT 5 s
[T1] MK CLRWR
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.441 GHz
500 ms/
ADT CORP.


RBW 100 kHz
VBW 100 kHz
SWT 5 ms
[T1] MK CLRWR
Marker 1 [T1]
-58.41 dBm
996.543853 us
Delta [1]
1.10 dB
3.025791 ms
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.441 GHz
500 us/
ADT CORP.

## 4.5 CHANNEL BANDWIDTH

### 4.5.1 LIMITS OF CHANNEL BANDWIDTH

For frequency hopping system operating in the 2400-2483.5MHz, If the 20dB bandwidth of hopping channel is greater than 25kHz, two-thirds 20dBbandwidth of hopping channel shell be a minimum limit for the hopping channel separation.

### 4.5.2 TEST INSTRUMENTS

| Description & Manufacturer | Model No. | Serial No. | Calibrated Date | Calibrated Until |
|---|---|---|---|---|
| SPECTRUM ANALYZER | FSP 40 | 100036 | Mar. 14, 2007 | Mar. 13, 2008 |

**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

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

b. 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.

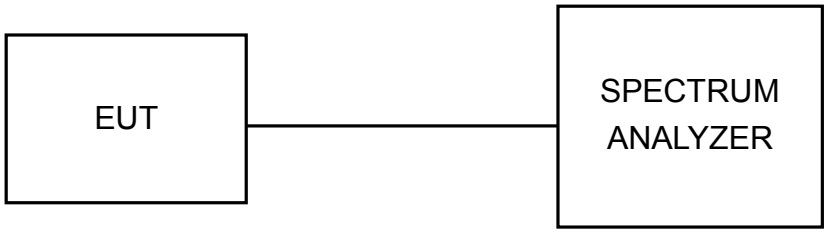
c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.

d. 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 EUT OPERATING CONDITION

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

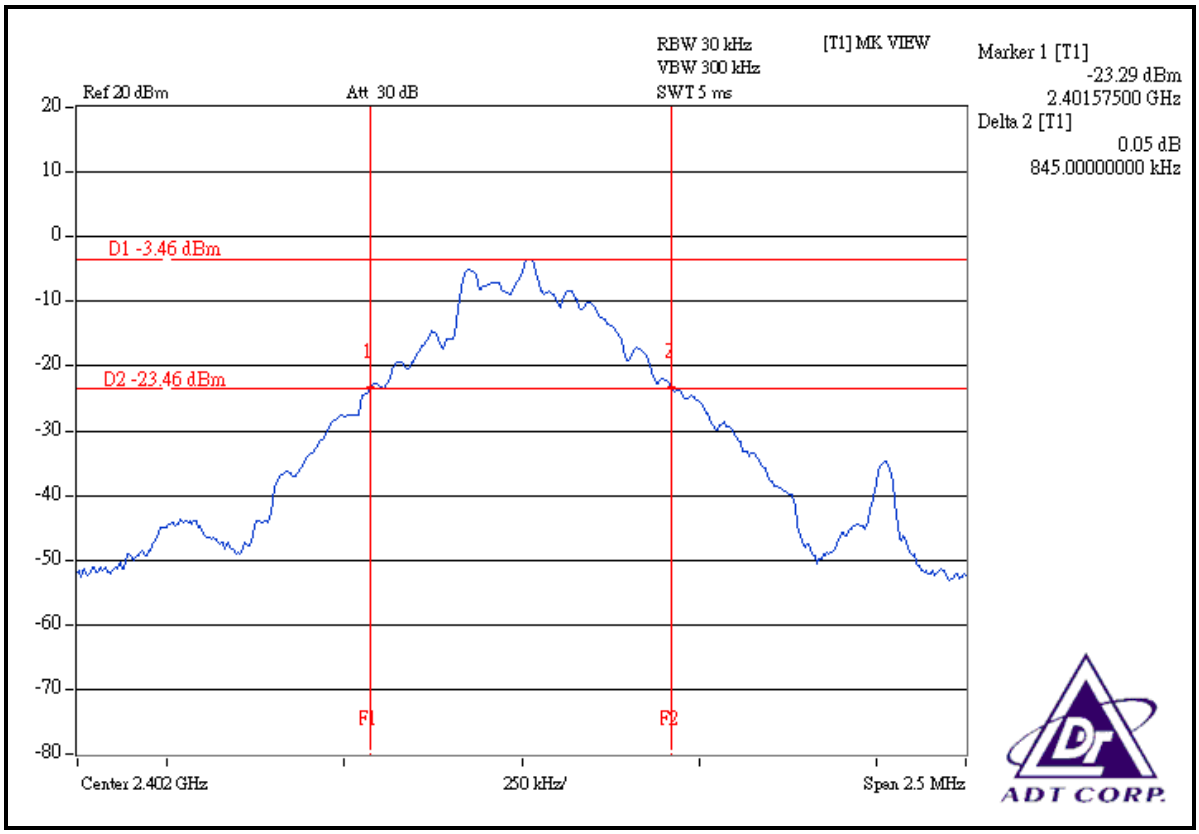
## 4.5.7 TEST RESULTS

### Mode A: FOR GFSK

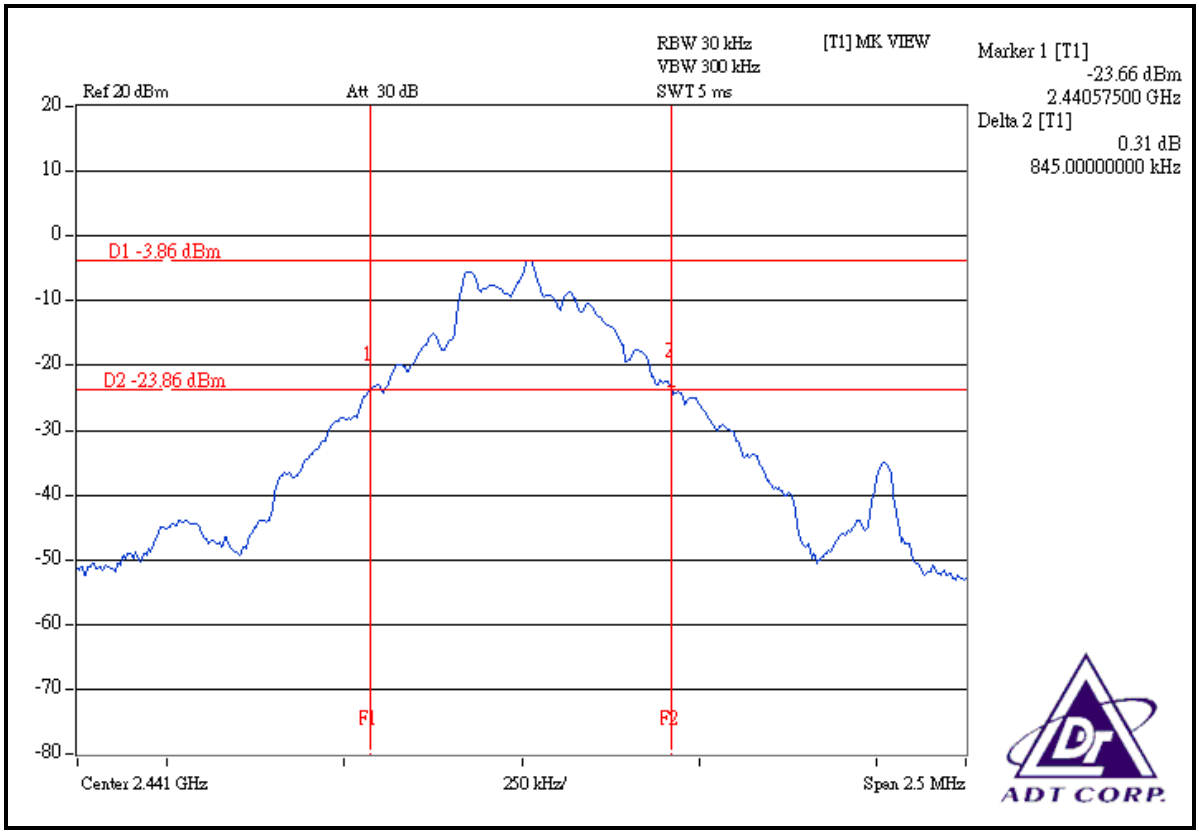
| MODULATION TYPE | GFSK | CHANNEL | 0, 39, 78 |
|---|---|---|---|
| INPUT POWER | 3.7Vdc | ENVIRONMENTAL CONDITIONS | 25 deg. C, 60%RH, 998hPa |
| TESTED BY | Jamison Chen | | |

| CHANNEL | CHANNEL FREQUENCY (MHz) | 20dB BANDWIDTH (MHz) |
|---|---|---|
| 0 | 2402 | 0.845 |
| 39 | 2441 | 0.845 |
| 78 | 2480 | 0.835 |

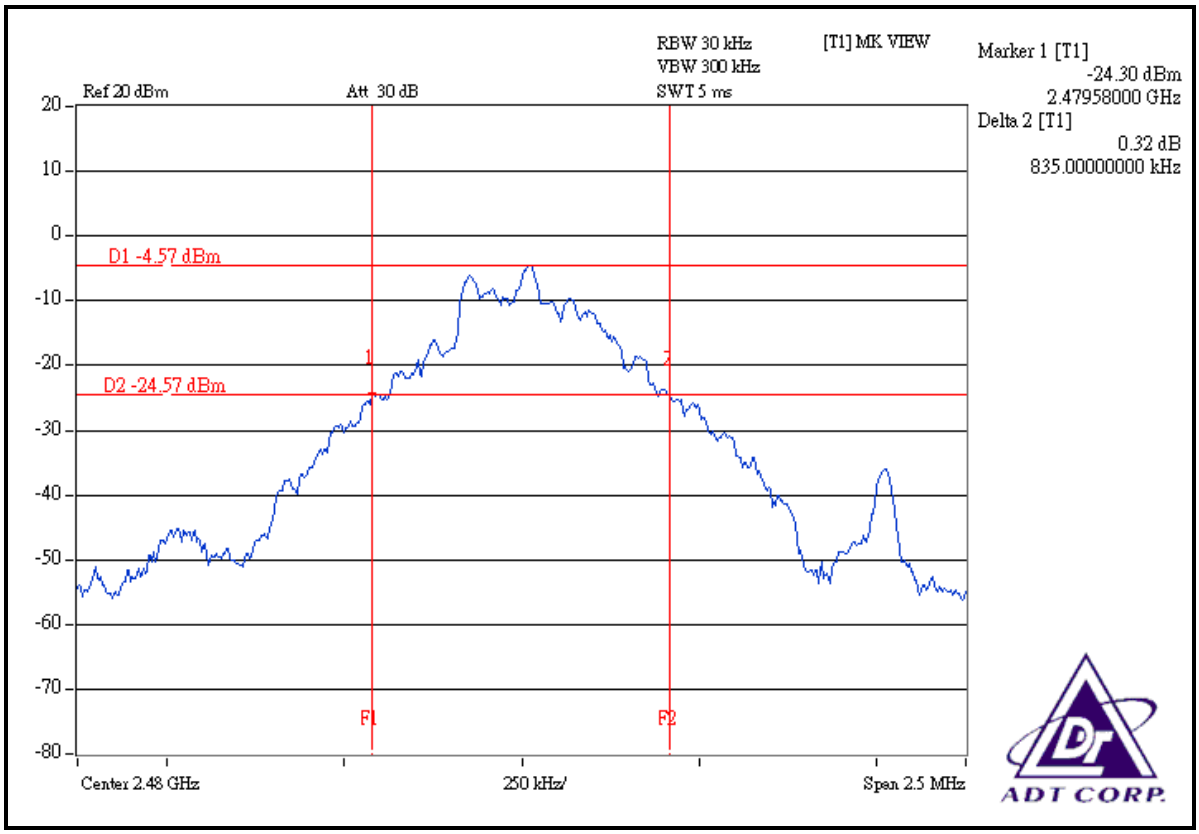
### CH 0



## CH 39


RBW 30 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK VIEW
Marker 1 [T1]
-23.66 dBm
2.44057500 GHz
Delta 2 [T1]
0.31 dB
845.00000000 kHz
Ref 20 dBm
Att 30 dB
D1 -3.86 dBm
D2 -23.86 dBm
F1
F2
Center 2.441 GHz
250 kHz/
Span 2.5 MHz
ADT CORP.

## CH 78

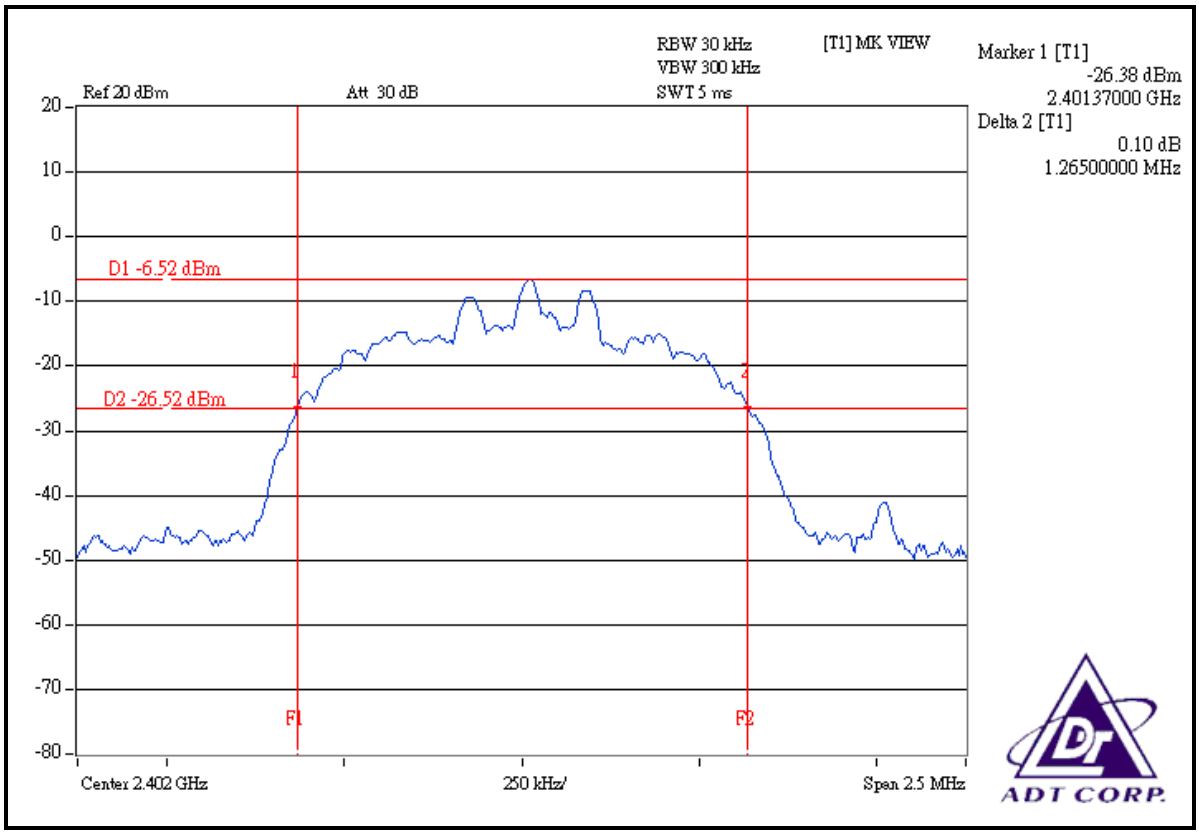

RBW 30 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK VIEW
Marker 1 [T1]
-24.30 dBm
2.47958000 GHz
Delta 2 [T1]
0.32 dB
835.00000000 kHz
Ref 20 dBm
Att 30 dB
D1 -4.57 dBm
D2 -24.57 dBm
F1
F2
Center 2.48 GHz
250 kHz/
Span 2.5 MHz
ADT CORP.

## Mode A: FOR 8DPSK

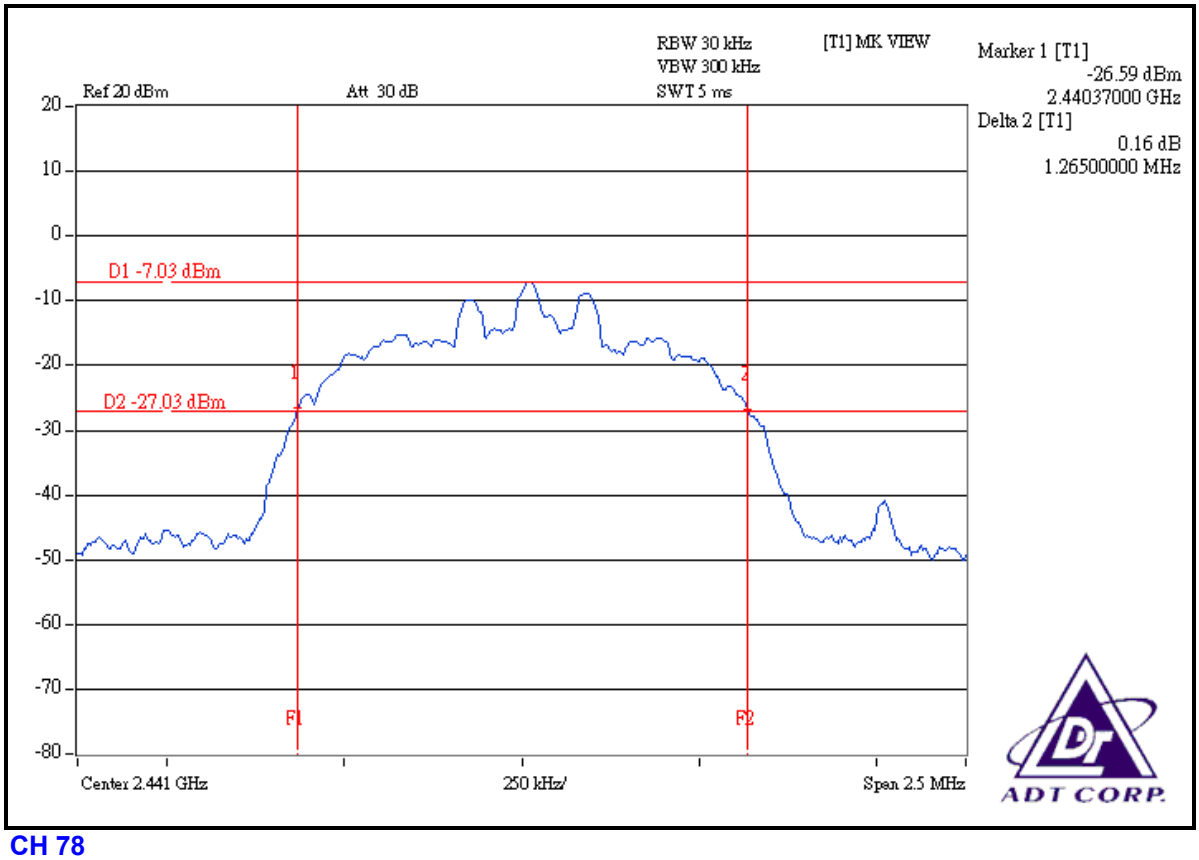
| MODULATION TYPE | 8DPSK | CHANNEL | 0, 39, 78 |
|---|---|---|---|
| INPUT POWER | 3.7Vdc | ENVIRONMENTAL CONDITIONS | 25 deg. C, 60%RH, 995hPa |
| TESTED BY | Jamison Chen | | |

| CHANNEL | CHANNEL FREQUENCY (MHz) | 20dB BANDWIDTH (MHz) |
|---|---|---|
| 0 | 2402 | 1.265 |
| 39 | 2441 | 1.265 |
| 78 | 2480 | 1.270 |

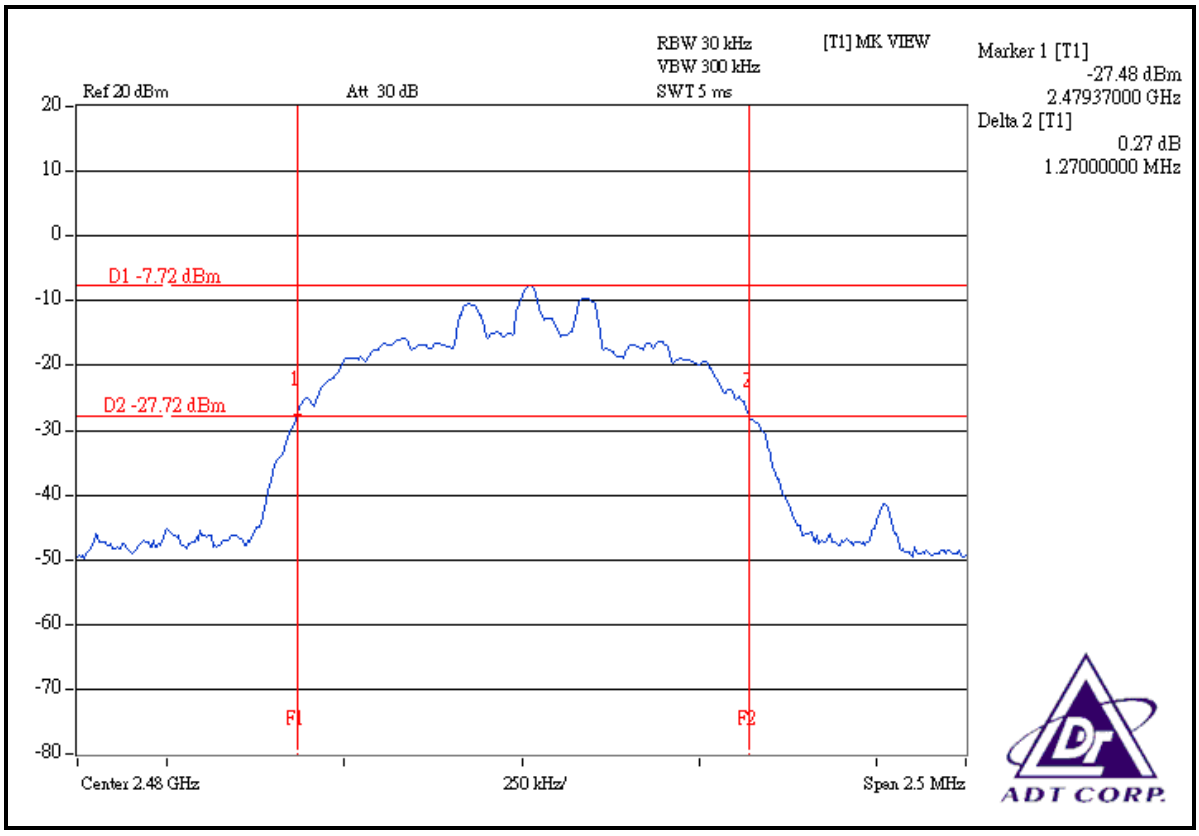
## CH 0



## CH 39


RBW 30 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK VIEW
Marker 1 [T1]
-26.59 dBm
2.44037000 GHz
Delta 2 [T1]
0.16 dB
1.26500000 MHz
Ref 20 dBm
Att 30 dB
D1 -7.03 dBm
D2 -27.03 dBm
Center 2.441 GHz
250 kHz/
Span 2.5 MHz
ADT CORP.

## CH 78


RBW 30 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK VIEW
Marker 1 [T1]
-27.48 dBm
2.47937000 GHz
Delta 2 [T1]
0.27 dB
1.27000000 MHz
Ref 20 dBm
Att 30 dB
D1 -7.72 dBm
D2 -27.72 dBm
Center 2.48 GHz
250 kHz/
Span 2.5 MHz
ADT CORP.

## 4.6 HOPPING CHANNEL SEPARATION

## 4.6.1 LIMIT OF HOPPING CHANNEL SEPARATION

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

## 4.6.2 TEST INSTRUMENTS

| Description & Manufacturer | Model No. | Serial No. | Calibrated Date | Calibrated Until |
|---|---|---|---|---|
| SPECTRUM ANALYZER | FSP 40 | 100036 | Mar. 14, 2007 | Mar. 13, 2008 |

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

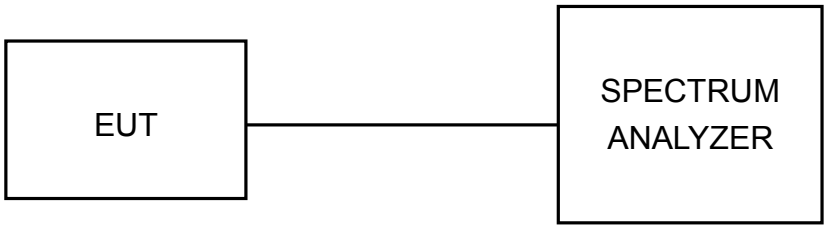
## 4.6.3 TEST PROCEDURES

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.
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.

## 4.6.4 DEVIATION FROM TEST STANDARD

No deviation.

## 4.6.5 TEST SETUP




## 4.6.6 TEST RESULTS

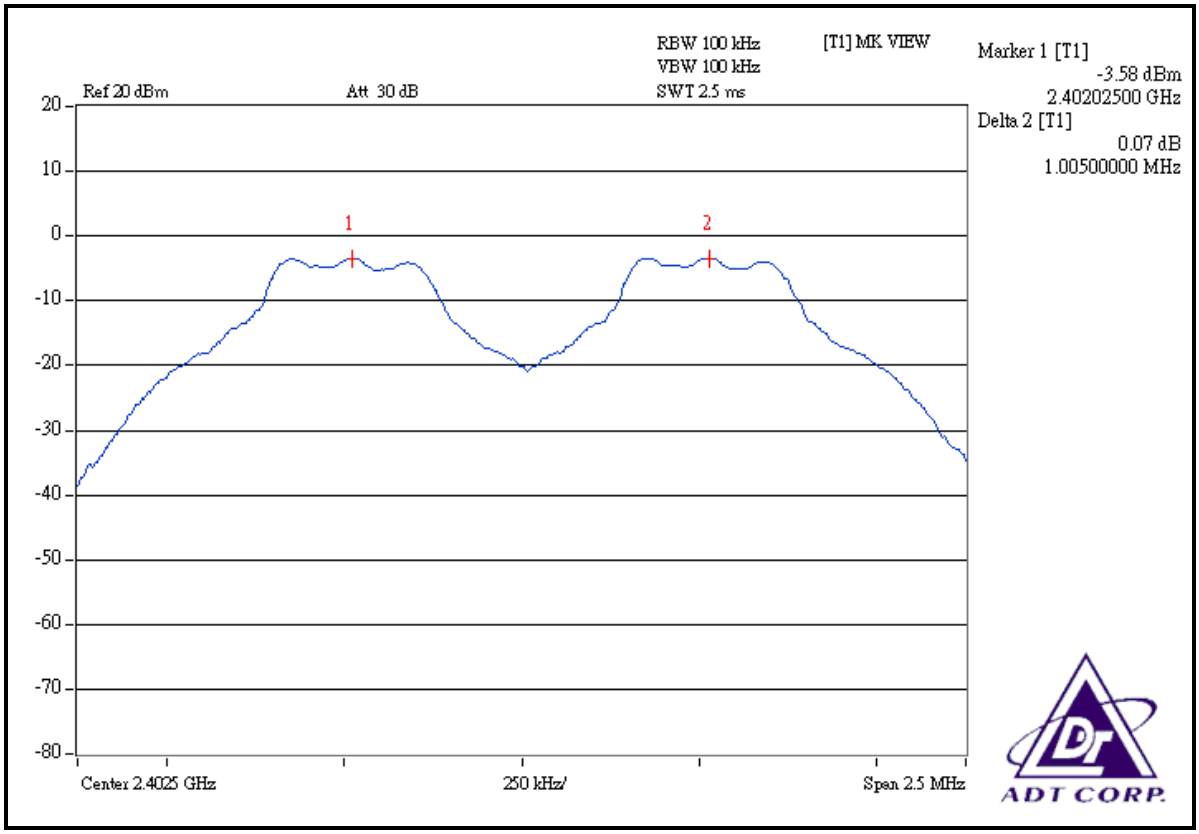
**Mode A: FOR GFSK**

| | | | |
|---|---|---|---|
| **MODULATION TYPE** | GFSK | **CHANNEL** | 0, 39, 78 |
| **INPUT POWER** | 3.7Vdc | **ENVIRONMENTAL CONDITIONS** | 25 deg. C, 60%RH, 995hPa |
| **TESTED BY** | Jamison Chen | | |

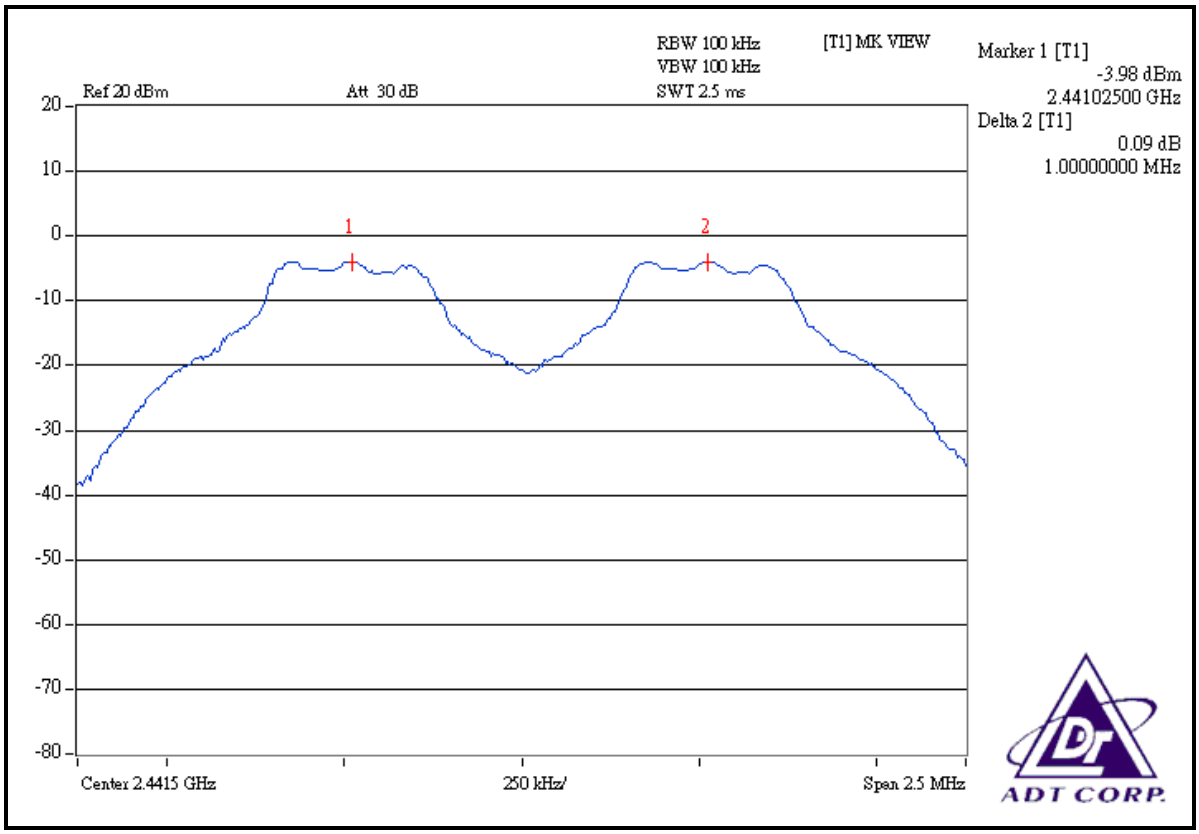
| CHANNEL | FREQUENCY (MHz) | ADJACENT CHANNEL SEPARATION (MHz) | 20dB BANDWIDTH (MHz) | MINIMUM LIMIT (MHz) | PASS / FAIL |
|---|---|---|---|---|---|
| 0 | 2402 | 1.005 | 0.845 | 0.563 | PASS |
| 39 | 2441 | 1.000 | 0.845 | 0.563 | PASS |
| 78 | 2480 | 1.002 | 0.835 | 0.557 | PASS |

**NOTE:** The minimum limit is two-third 20dB bandwidth. Test results please refer to next two pages.

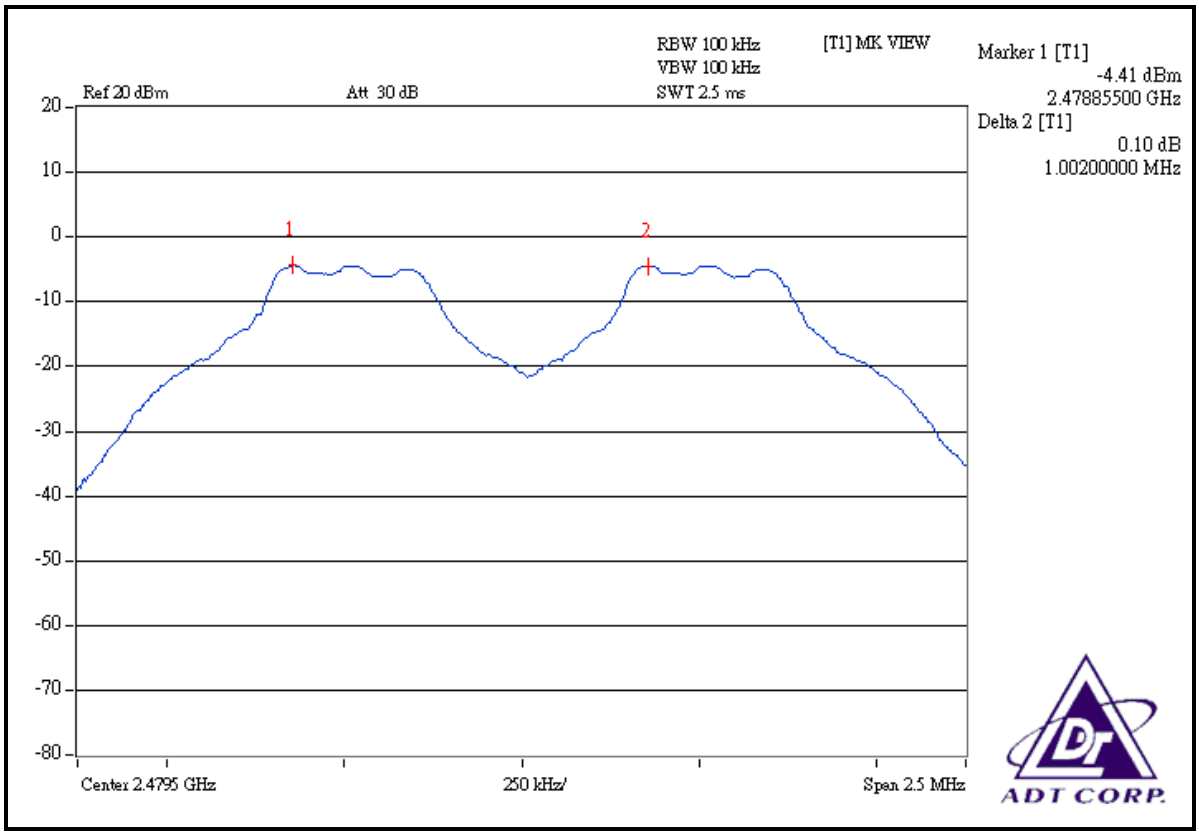
## CH 0


RBW 100 kHz
VBW 100 kHz
SWT 2.5 ms
[T1] MK VIEW
Marker 1 [T1]
-3.58 dBm
2.40202500 GHz
Delta 2 [T1]
0.07 dB
1.00500000 MHz
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1
2
Center 2.4025 GHz
250 kHz/
Span 2.5 MHz
ADT CORP.

## CH 39


RBW 100 kHz
VBW 100 kHz
SWT 2.5 ms
[T1] MK VIEW
Marker 1 [T1]
-3.98 dBm
2.44102500 GHz
Delta 2 [T1]
0.09 dB
1.00000000 MHz
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1
2
Center 2.4415 GHz
250 kHz/
Span 2.5 MHz
ADT CORP.

## CH 78


RBW 100 kHz
VBW 100 kHz
SWT 2.5 ms
[T1] MK VIEW
Marker 1 [T1]
-4.41 dBm
2.47885500 GHz
Delta 2 [T1]
0.10 dB
1.00200000 MHz
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1
2
Center 2.4795 GHz
250 kHz/
Span 2.5 MHz
ADT CORP.

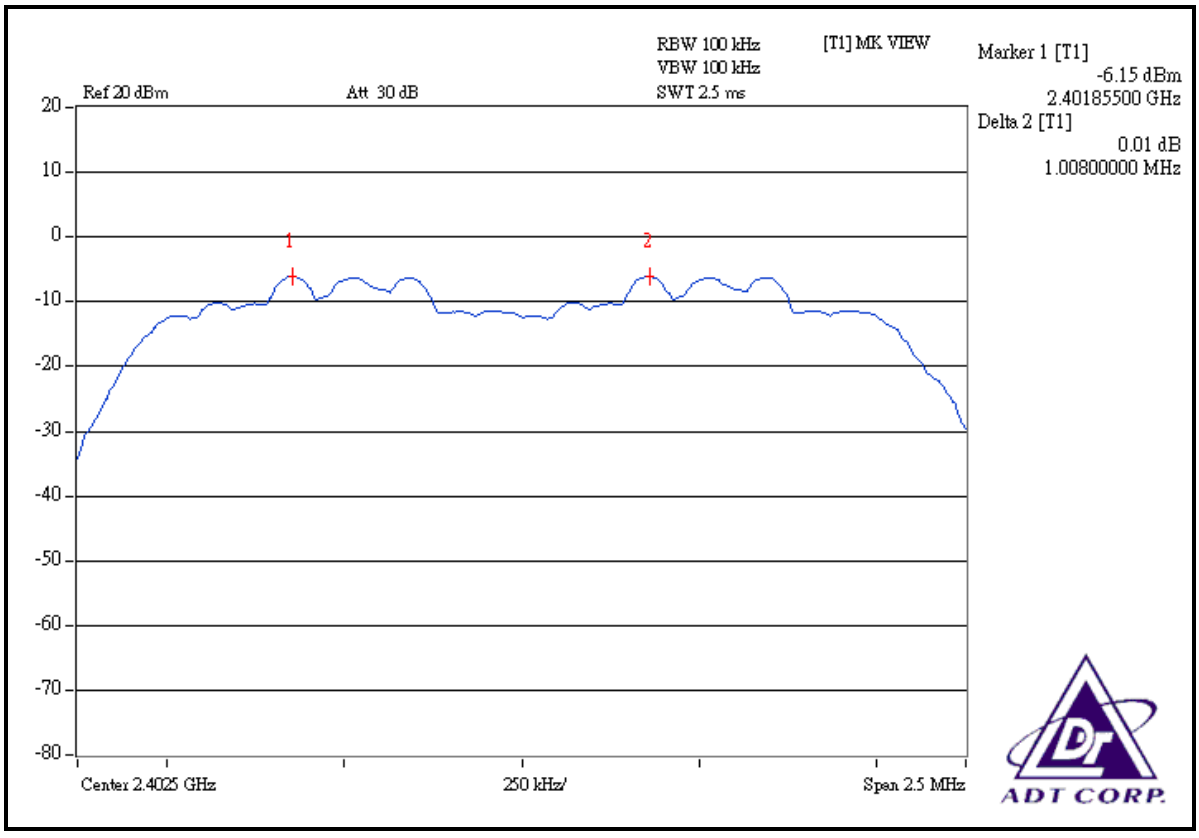
**Mode A: FOR 8DPSK**

| | | | |
|---|---|---|---|
| **MODULATION TYPE** | 8DPSK | **CHANNEL** | 0, 39, 78 |
| **INPUT POWER** | 3.7Vdc | **ENVIRONMENTAL CONDITIONS** | 25 deg. C, 60%RH, 995hPa |
| **TESTED BY** | Jamison Chen | | |

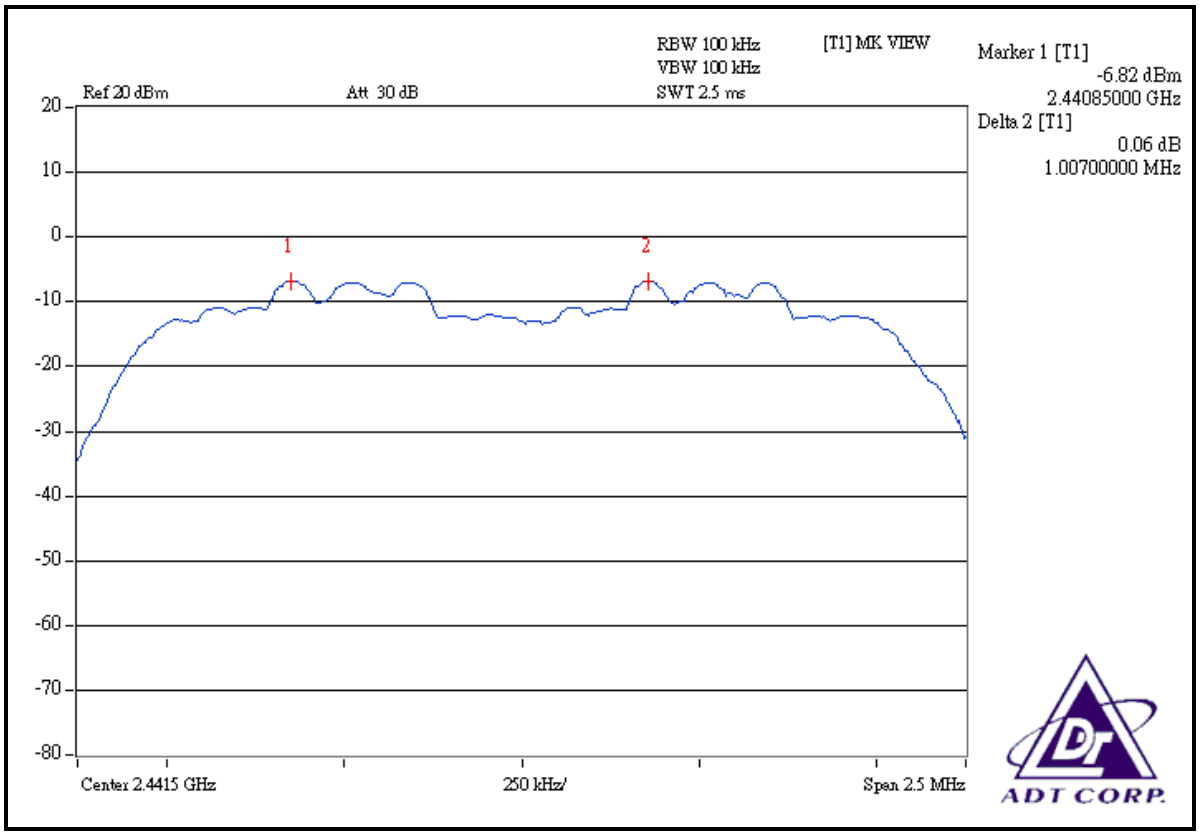
| CHANNEL | FREQUENCY (MHz) | ADJACENT CHANNEL SEPARATION (MHz) | 20dB BANDWIDTH (MHz) | MINIMUM LIMIT (MHz) | PASS / FAIL |
|---|---|---|---|---|---|
| 0 | 2402 | 1.008 | 1.265 | 0.843 | PASS |
| 39 | 2441 | 1.007 | 1.265 | 0.843 | PASS |
| 78 | 2480 | 1.004 | 1.270 | 0.847 | PASS |

**NOTE:** The minimum limit is two-third 20dB bandwidth. Test results please refer to following three plots.

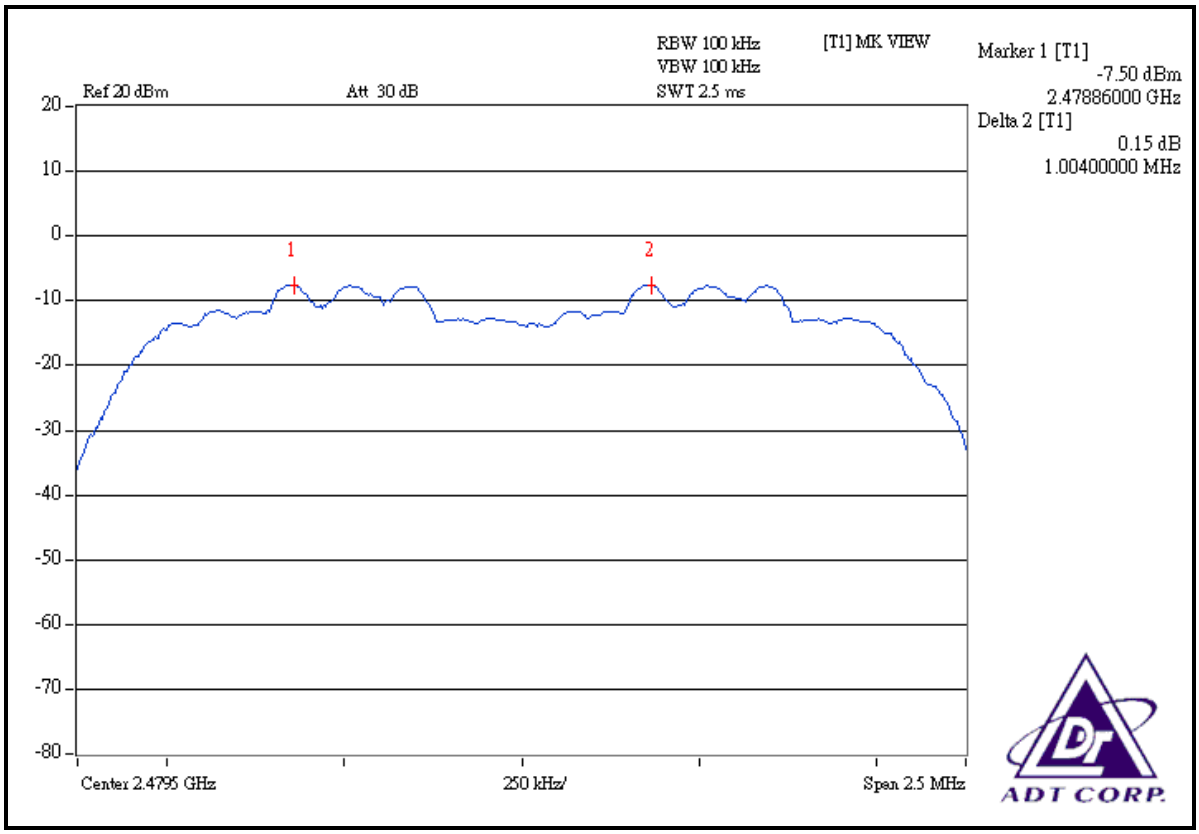
**CH 0**



## CH 39


RBW 100 kHz
VBW 100 kHz
SWT 2.5 ms
[T1] MK VIEW
Marker 1 [T1]
-6.82 dBm
2.44085000 GHz
Delta 2 [T1]
0.06 dB
1.00700000 MHz
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1
2
Center 2.4415 GHz
250 kHz/
Span 2.5 MHz
ADT CORP.

## CH 78


RBW 100 kHz
VBW 100 kHz
SWT 2.5 ms
[T1] MK VIEW
Marker 1 [T1]
-7.50 dBm
2.47886000 GHz
Delta 2 [T1]
0.15 dB
1.00400000 MHz
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1
2
Center 2.4795 GHz
250 kHz/
Span 2.5 MHz
ADT CORP.

## 4.7 MAXIMUM PEAK OUTPUT POWER

### 4.7.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Measurement is 125mW.

### 4.7.2 TEST INSTRUMENTS

| Description & Manufacturer | Model No. | Serial No. | Calibrated Date | Calibrated Until |
|---|---|---|---|---|
| SPECTRUM ANALYZER | FSP 40 | 100036 | Mar. 14, 2007 | Mar. 13, 2008 |

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

### 4.7.3 TEST PROCEDURES

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

b. 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.

c. The center frequency of the spectrum analyzer is set to the fundamental frequency and using 3MHz RBW and 10 MHz VBW.

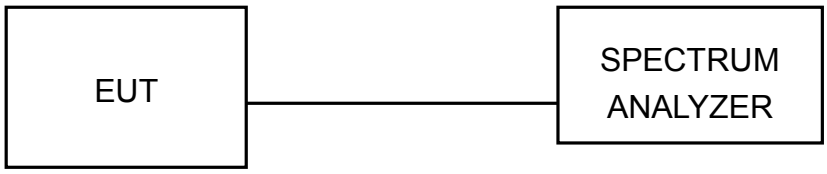
d. Measure the captured power within the band and recording the plot.

e. Repeat above procedures until all frequencies required were complete.

### 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 EUT OPERATING CONDITION

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

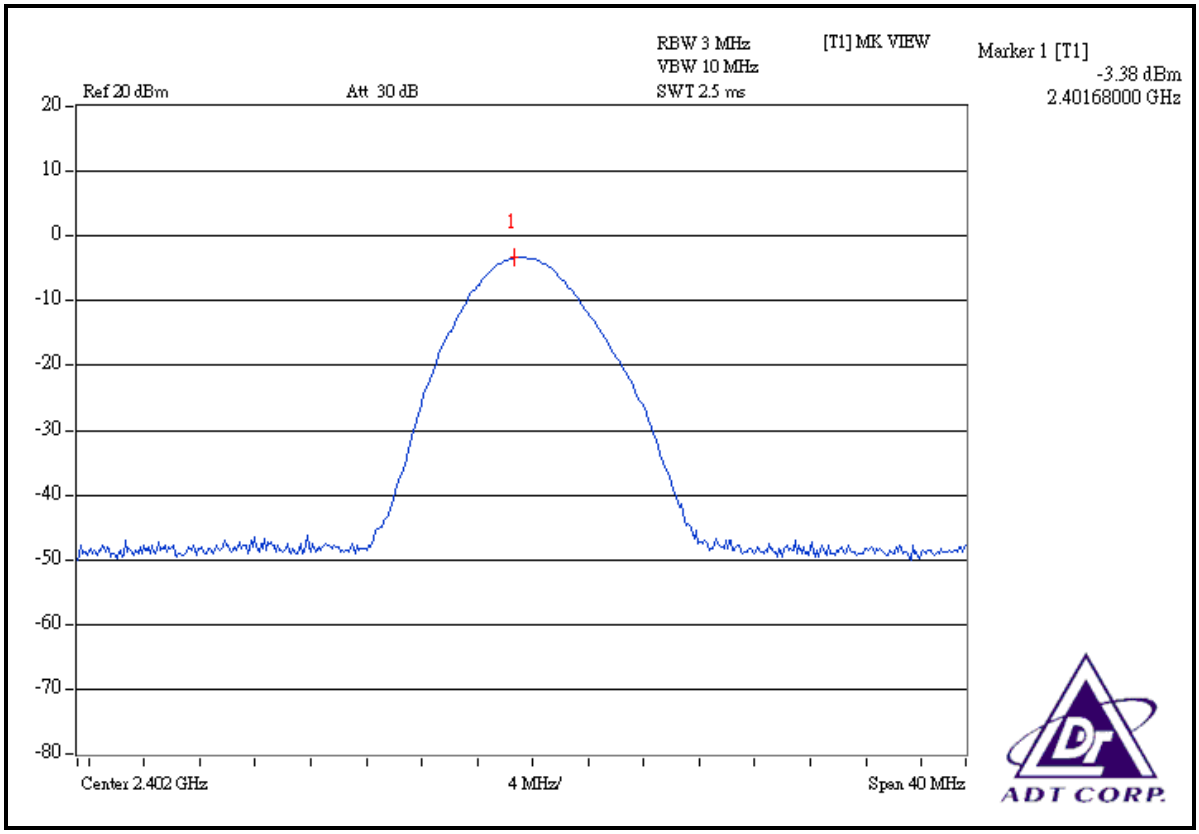
## 4.7.7 TEST RESULTS

**Mode A: FOR GFSK**

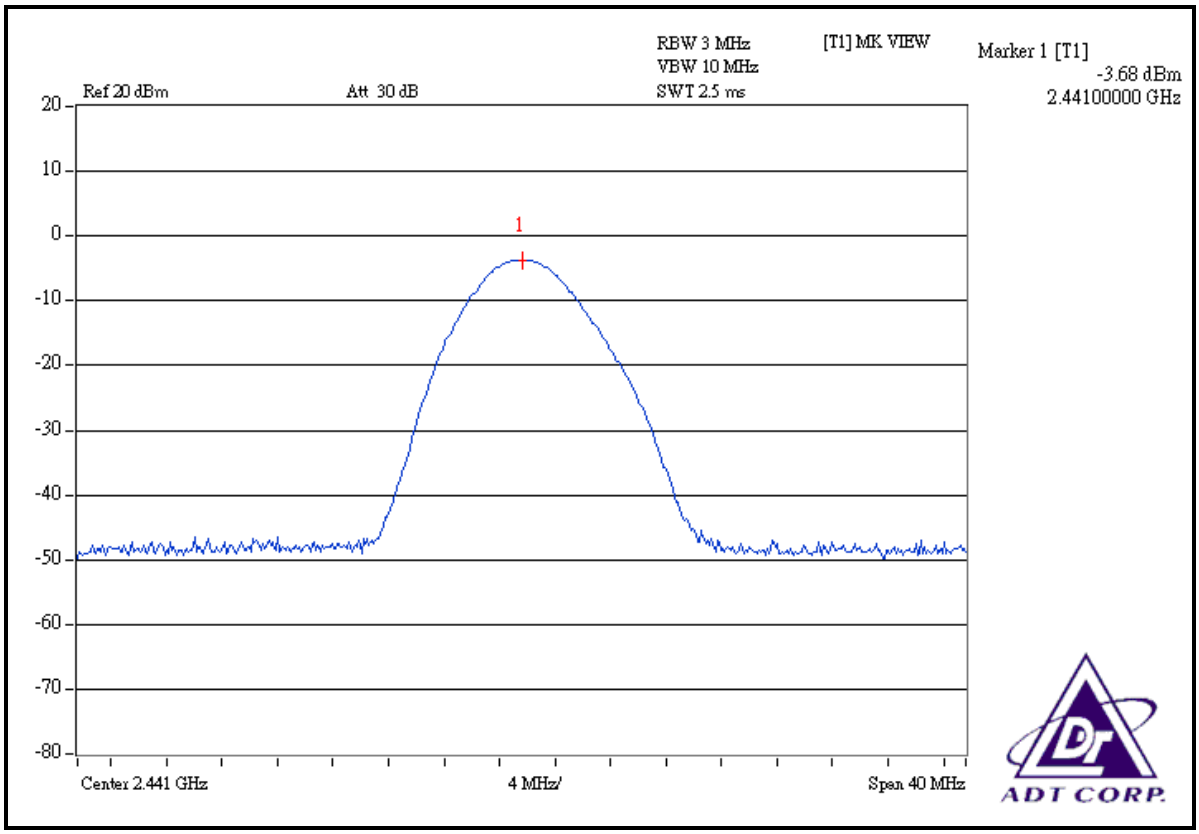
| | | | |
|---|---|---|---|
| **MODULATION TYPE** | GFSK | **CHANNEL** | 0, 39, 78 |
| **INPUT POWER** | 3.7Vdc | **ENVIRONMENTAL CONDITIONS** | 25 deg. C, 60%RH, 995hPa |
| **TESTED BY** | Jamison Chen | | |

| CHANNEL | CHANNEL FREQUENCY (MHz) | PEAK POWER OUTPUT (mW) | PEAK POWER OUTPUT (dBm) | PEAK POWER LIMIT (mW) | PASS/FAIL |
|---|---|---|---|---|---|
| 0 | 2402 | 0.459 | -3.38 | 125 | PASS |
| 39 | 2441 | 0.429 | -3.68 | 125 | PASS |
| 78 | 2480 | 0.372 | -4.29 | 125 | PASS |

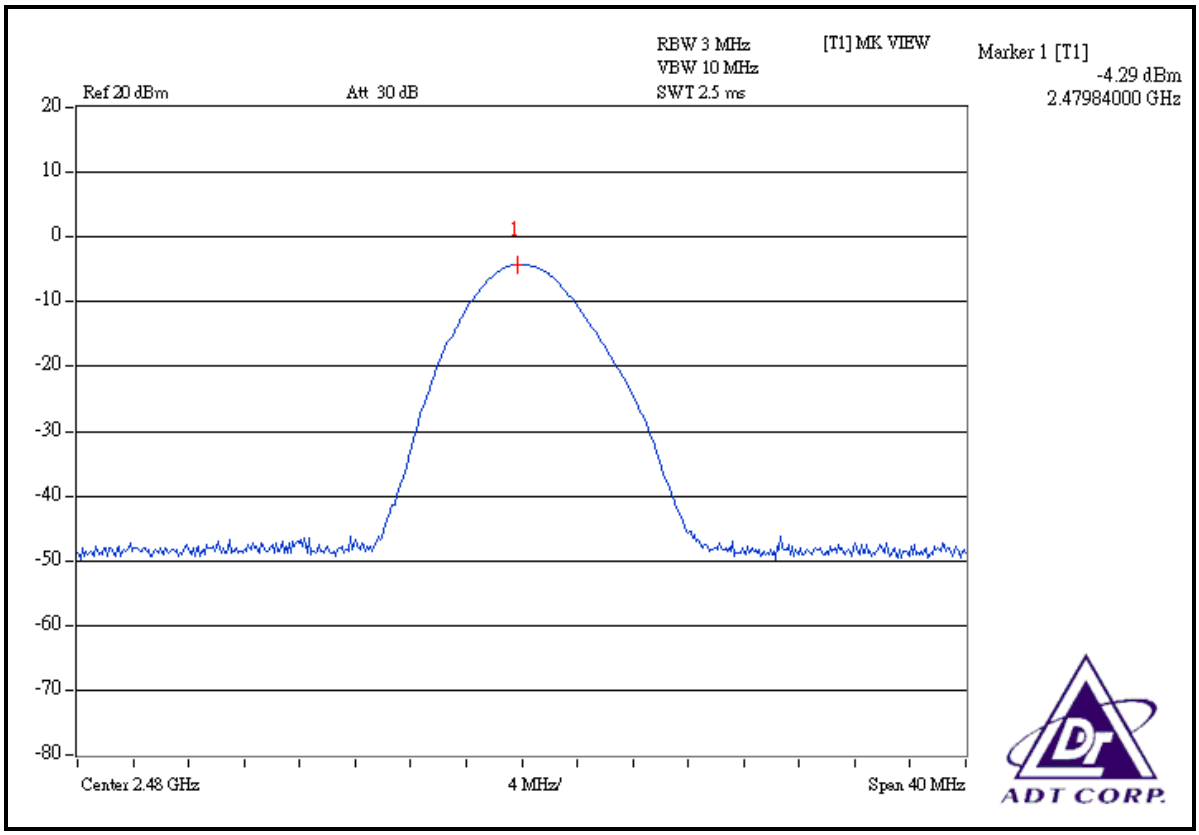
## CH 0


RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
[T1] MK VIEW
Marker 1 [T1]
-3.38 dBm
2.40168000 GHz
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1
Center 2.402 GHz
4 MHz/
Span 40 MHz
ADT CORP.

## CH 39


RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
[T1] MK VIEW
Marker 1 [T1]
-3.68 dBm
2.44100000 GHz
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1
Center 2.441 GHz
4 MHz/
Span 40 MHz
ADT CORP.

## CH 78

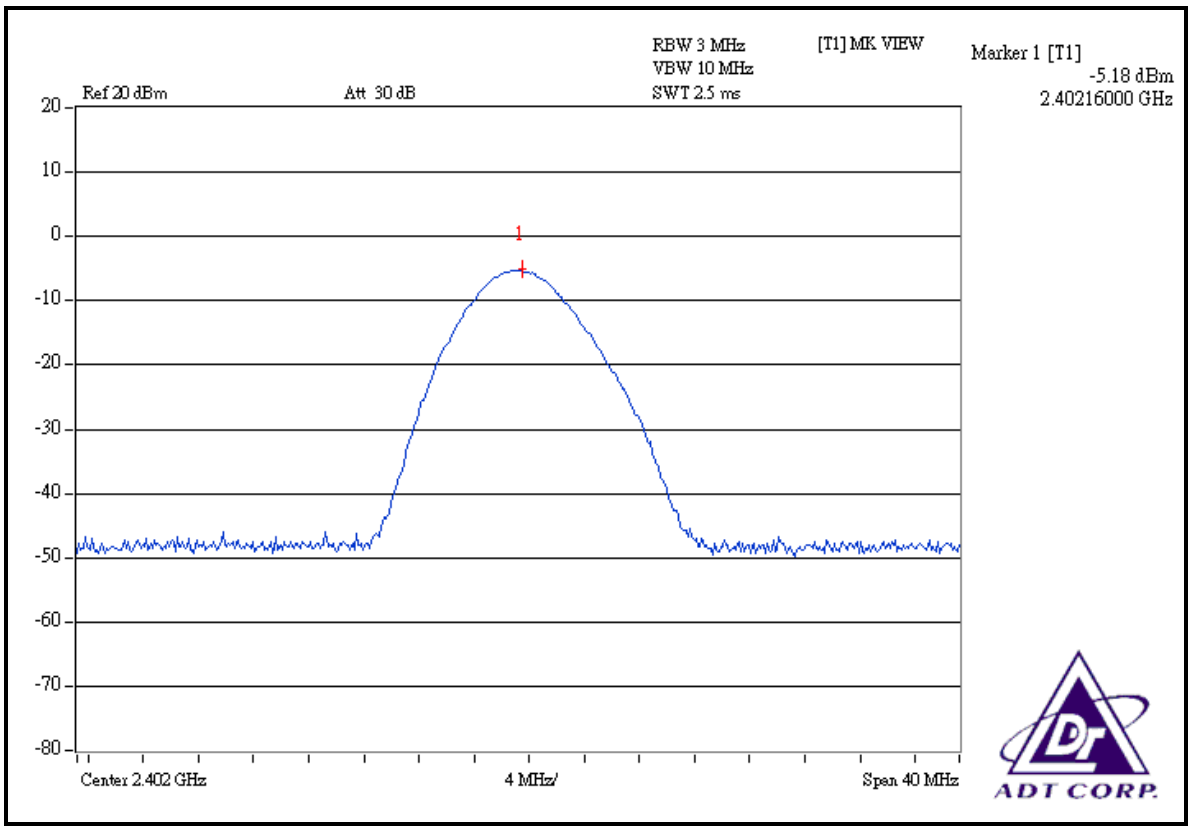

RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
[T1] MK VIEW
Marker 1 [T1]
-4.29 dBm
2.47984000 GHz
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1
Center 2.48 GHz
4 MHz/
Span 40 MHz
ADT CORP.

## Mode A: FOR 8DPSK

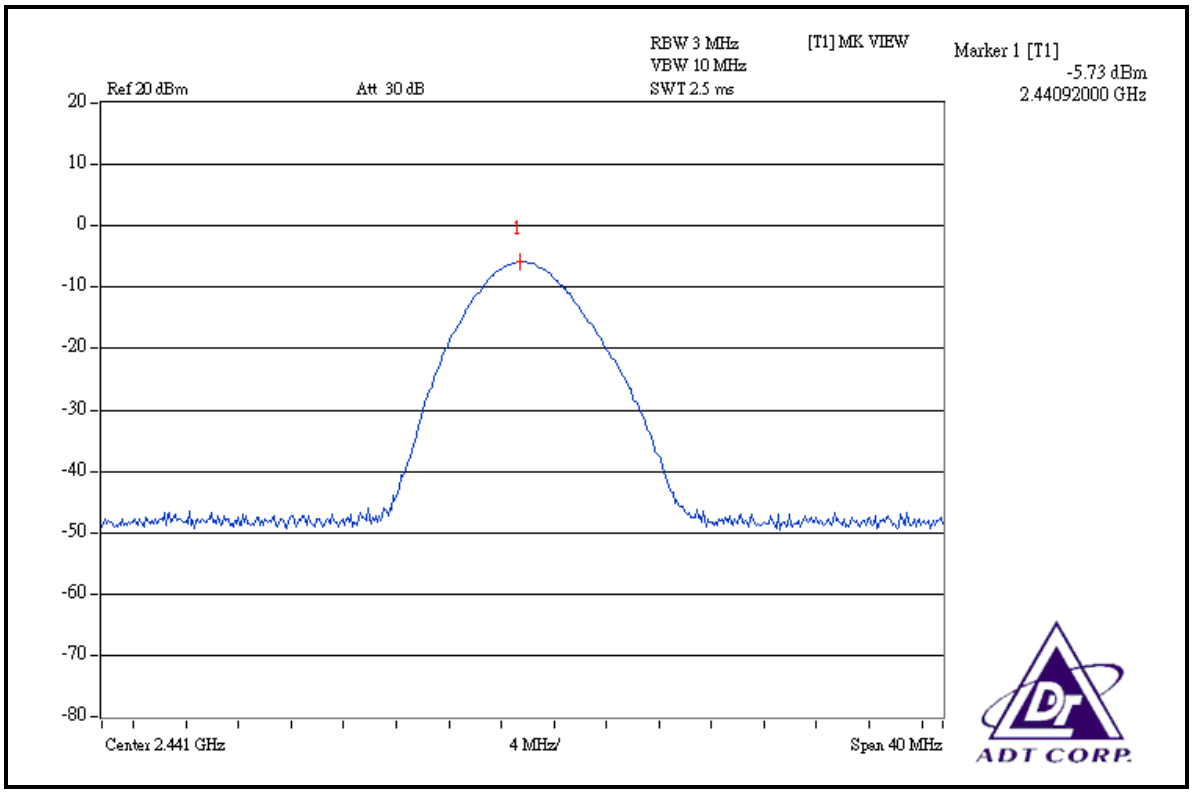
| MODULATION TYPE | 8DPSK | CHANNEL | 0, 39, 78 |
|---|---|---|---|
| INPUT POWER | 3.7Vdc | ENVIRONMENTAL CONDITIONS | 25 deg. C, 60%RH, 995hPa |
| TESTED BY | Jamison Chen | | |

| CHANNEL | CHANNEL FREQUENCY (MHz) | PEAK POWER OUTPUT (mW) | PEAK POWER OUTPUT (dBm) | PEAK POWER LIMIT (mW) | PASS/FAIL |
|---|---|---|---|---|---|
| 0 | 2402 | 0.303 | -5.18 | 125 | PASS |
| 39 | 2441 | 0.267 | -5.73 | 125 | PASS |
| 78 | 2480 | 0.229 | -6.40 | 125 | PASS |

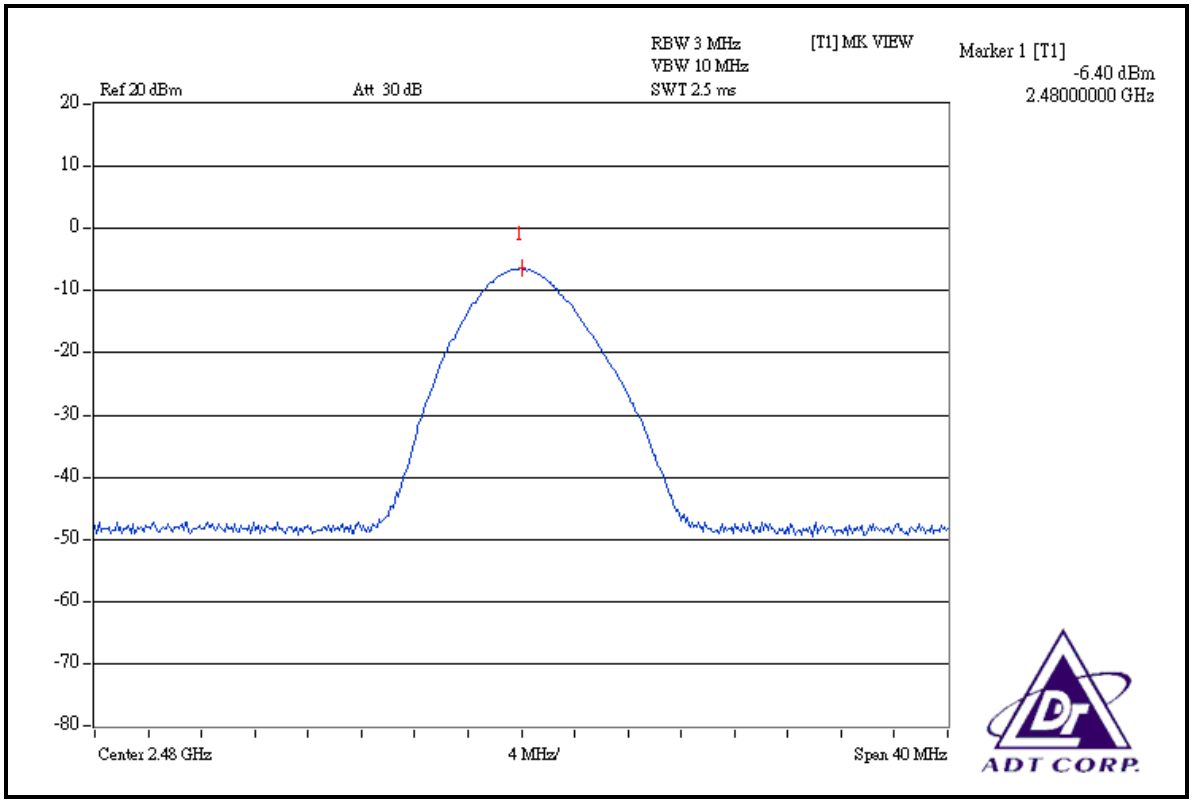
## CH 0



## CH 39


RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
[T1] MK VIEW
Marker 1 [T1]
-5.73 dBm
2.44092000 GHz
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.441 GHz
4 MHz/
Span 40 MHz
ADT CORP.

## CH 78


RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
[T1] MK VIEW
Marker 1 [T1]
-6.40 dBm
2.48000000 GHz
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.48 GHz
4 MHz/
Span 40 MHz
ADT CORP.

## 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 Date | Calibrated Until |
|---|---|---|---|---|
| SPECTRUM ANALYZER | FSP 40 | 100036 | Mar. 14, 2007 | Mar. 13, 2008 |

**NOTE:** 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 8 images. D1 line indicates the highest level, D2 line indicates the 20dB offset below D1. It shows compliance with the requirement in part 15.247(d).

**Mode A: FOR GFSK**

**NOTE 1:**
The band edge emission plot on the next page shows 44.63dBc between carrier maximum power and local maximum emission in restrict band (2.3670GHz). The emission of carrier strength list in the test result of channel 0 at the item 4.2.7 is 90.54dBuV/m (Peak), so the maximum field strength in restrict band is 90.54 – 44.63= 45.91dBuV/m, which is under 74 dBuV/m limit.

Average value = 45.91 - 30.1= 15.81dBuV/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)= -30.1 dB.

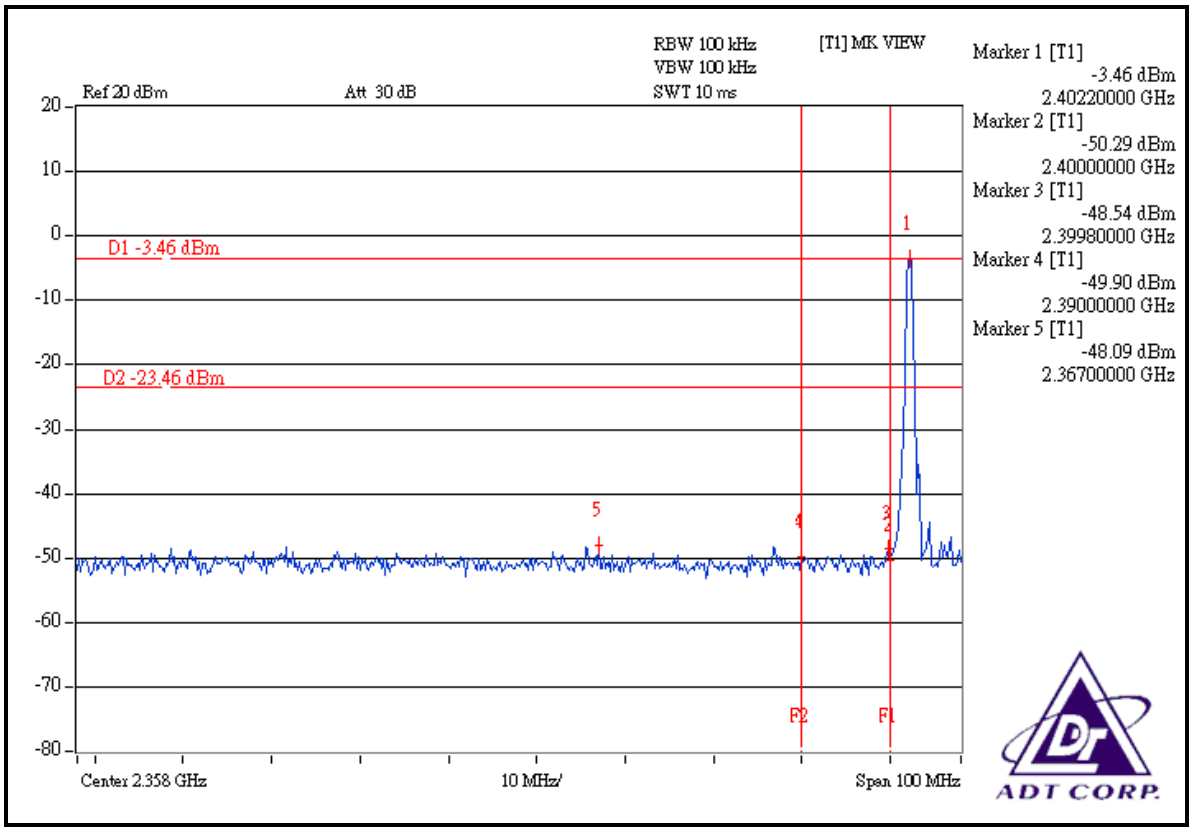
Average value = peak reading –30.1.

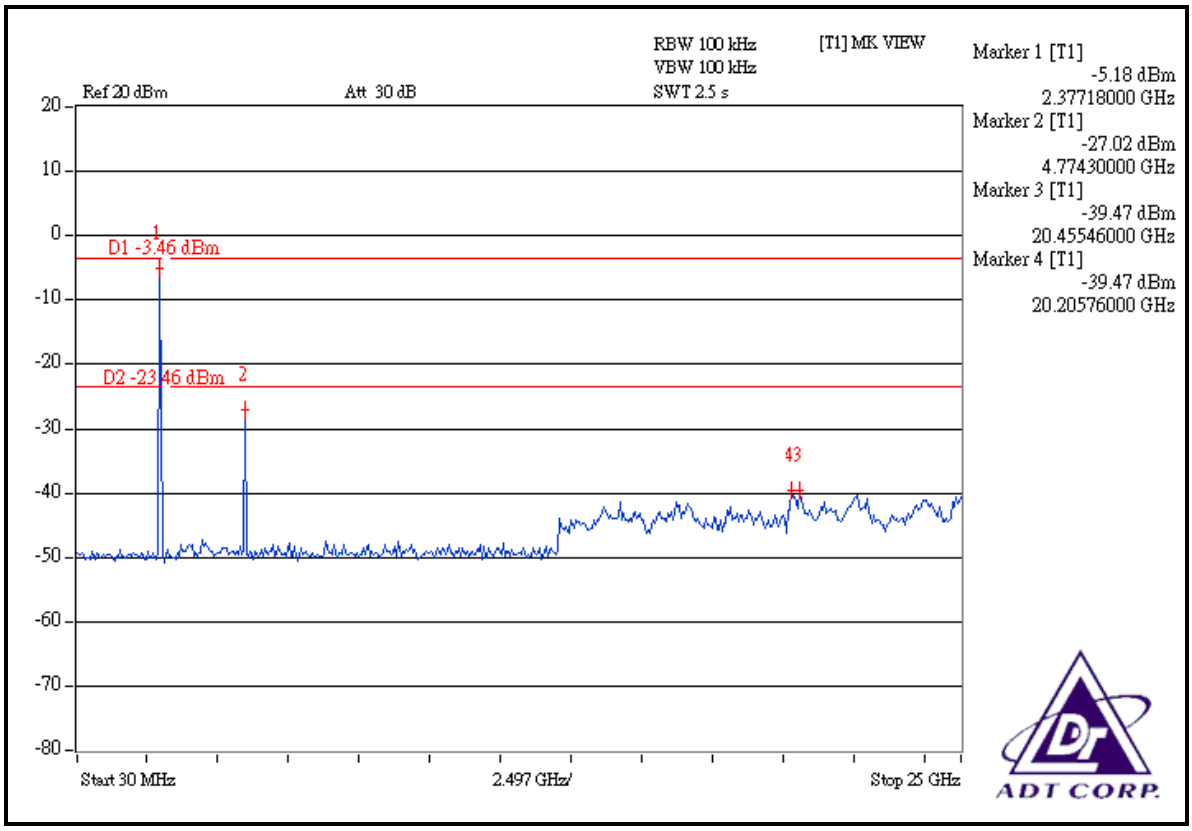
**NOTE 2:**
The band edge emission plot on the next second page shows 43.96dBc between carrier maximum power and local maximum emission in restrict band (2.4840GHz). The emission of carrier strength list in the test result of channel 78 at the item 4.2.7 is 91.47dBuV/m (Peak), so the maximum field strength in restrict band is 91.47 – 43.96 = 47.51dBuV/m, which is under 74 dBuV/m limit.

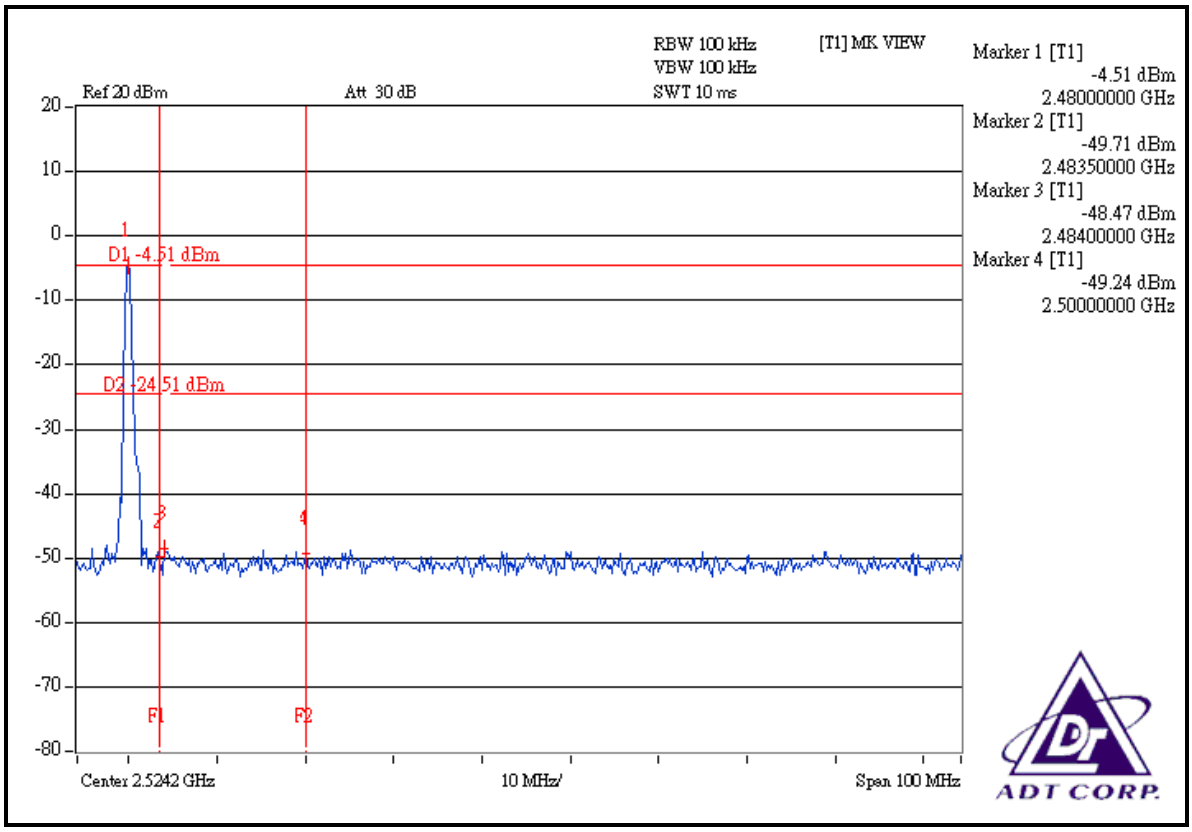
Average value = 47.51 - 30.10= 17.41dBuV/m, which is under 54dBuV/m limit.

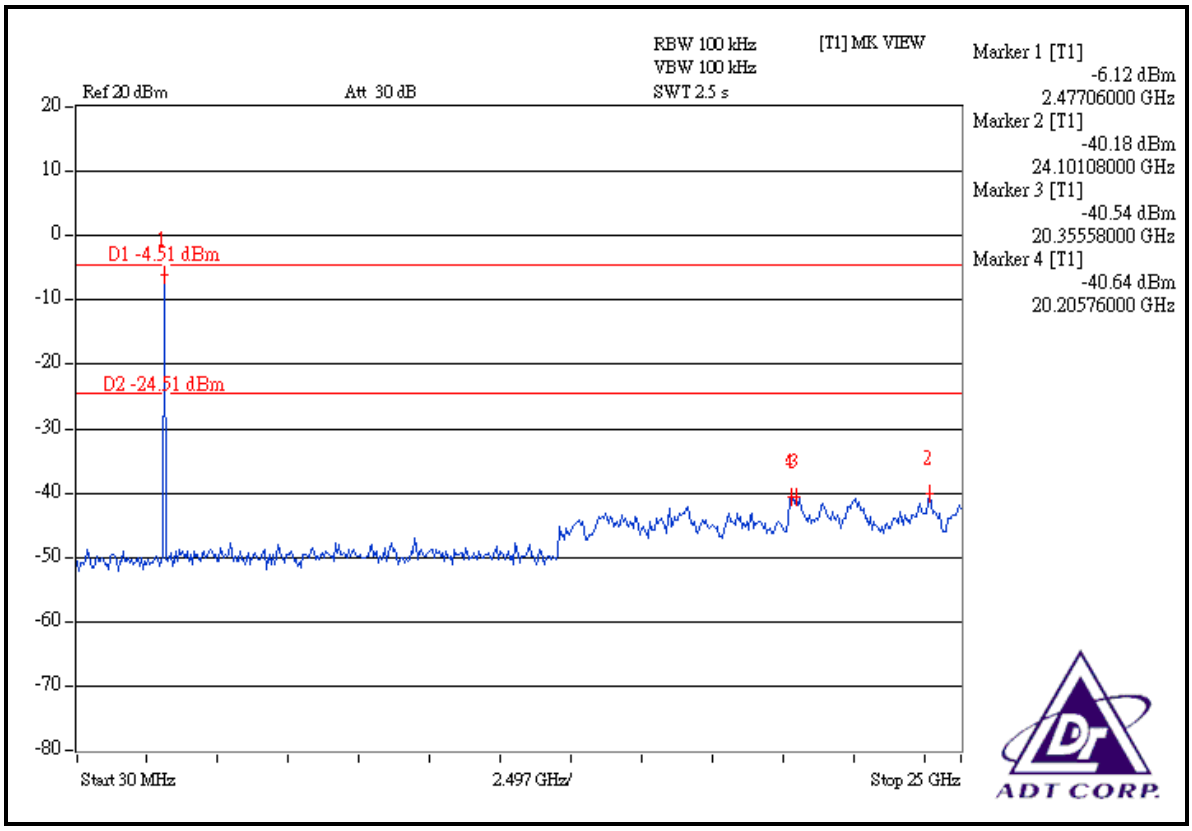
*The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle be equal to: 20log(3.125/100)= -30.1 dB.

Average value = peak reading –30.1.


RBW 100 kHz
VBW 100 kHz
SWT 10 ms
[T1] MK VIEW
Ref 20 dBm
Att 30 dB
D1 -3.46 dBm
D2 -23.46 dBm
Center 2.358 GHz
10 MHz/
Span 100 MHz
Marker 1 [T1]
-3.46 dBm
2.40220000 GHz
Marker 2 [T1]
-50.29 dBm
2.40000000 GHz
Marker 3 [T1]
-48.54 dBm
2.39980000 GHz
Marker 4 [T1]
-49.90 dBm
2.39000000 GHz
Marker 5 [T1]
-48.09 dBm
2.36700000 GHz
ADT CORP.


RBW 100 kHz
VBW 100 kHz
SWT 2.5 s
[T1] MK VIEW
Ref 20 dBm
Att 30 dB
D1 -3.46 dBm
D2 -23.46 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz
Marker 1 [T1]
-5.18 dBm
2.37718000 GHz
Marker 2 [T1]
-27.02 dBm
4.77430000 GHz
Marker 3 [T1]
-39.47 dBm
20.45546000 GHz
Marker 4 [T1]
-39.47 dBm
20.20576000 GHz
ADT CORP.


RBW 100 kHz
VBW 100 kHz
SWT 10 ms
[T1] MK VIEW
Ref 20 dBm
Att 30 dB
D1 -4.51 dBm
D2 -24.51 dBm
F1
F2
Center 2.5242 GHz
10 MHz/
Span 100 MHz
Marker 1 [T1]
-4.51 dBm
2.48000000 GHz
Marker 2 [T1]
-49.71 dBm
2.48350000 GHz
Marker 3 [T1]
-48.47 dBm
2.48400000 GHz
Marker 4 [T1]
-49.24 dBm
2.50000000 GHz
ADT CORP.


RBW 100 kHz
VBW 100 kHz
SWT 2.5 s
[T1] MK VIEW
Ref 20 dBm
Att 30 dB
D1 -4.51 dBm
D2 -24.51 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz
Marker 1 [T1]
-6.12 dBm
2.47706000 GHz
Marker 2 [T1]
-40.18 dBm
24.10108000 GHz
Marker 3 [T1]
-40.54 dBm
20.35558000 GHz
Marker 4 [T1]
-40.64 dBm
20.20576000 GHz
ADT CORP.

**Mode A: FOR 8DPSK**

**NOTE 1:**

The band edge emission plot on the next page shows 41.81dBc between carrier maximum power and local maximum emission in restrict band (2.3286GHz). The emission of carrier strength list in the test result of channel 0 at the item 4.2.7 is 91.19dBuV/m (Peak), so the maximum field strength in restrict band is 91.19 – 41.81 = 49.38dBuV/m, which is under 74 dBuV/m limit.

Average value = 49.38 - 30.10= 19.28dBuV/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)= -30.1 dB.

Average value = peak reading –30.1.

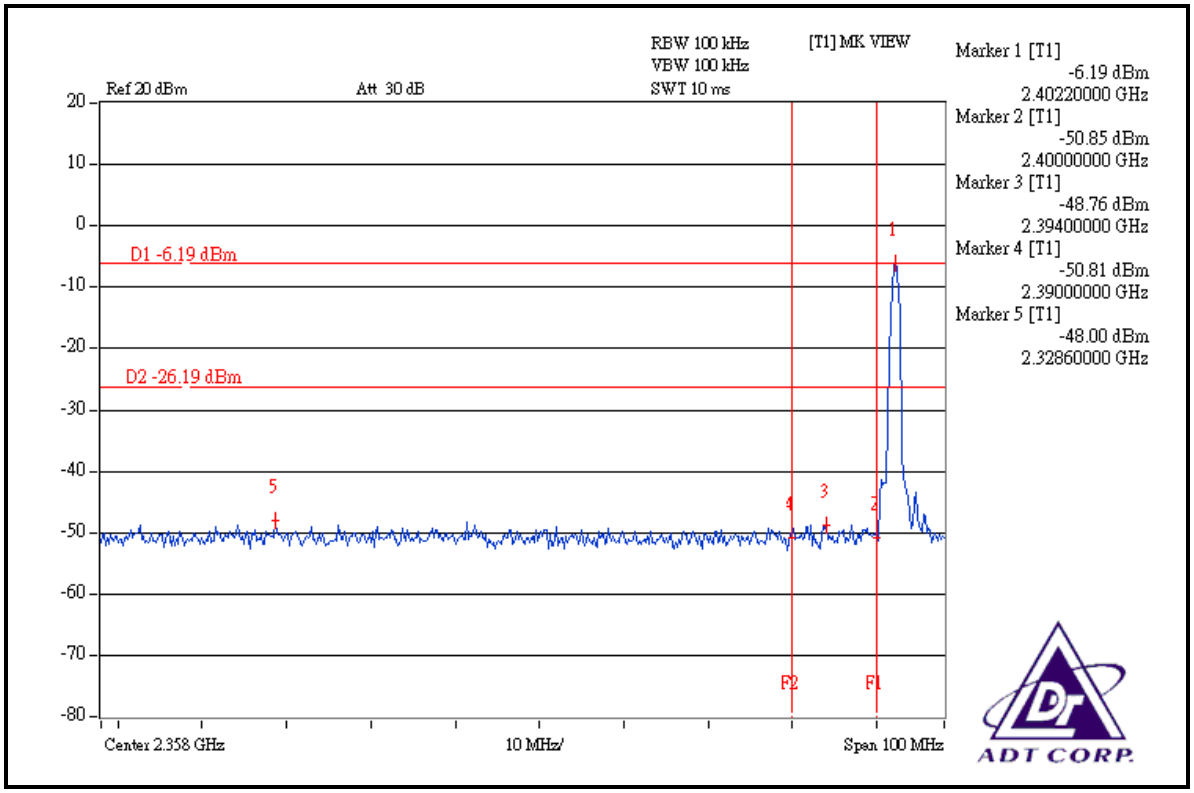
**NOTE 2:**

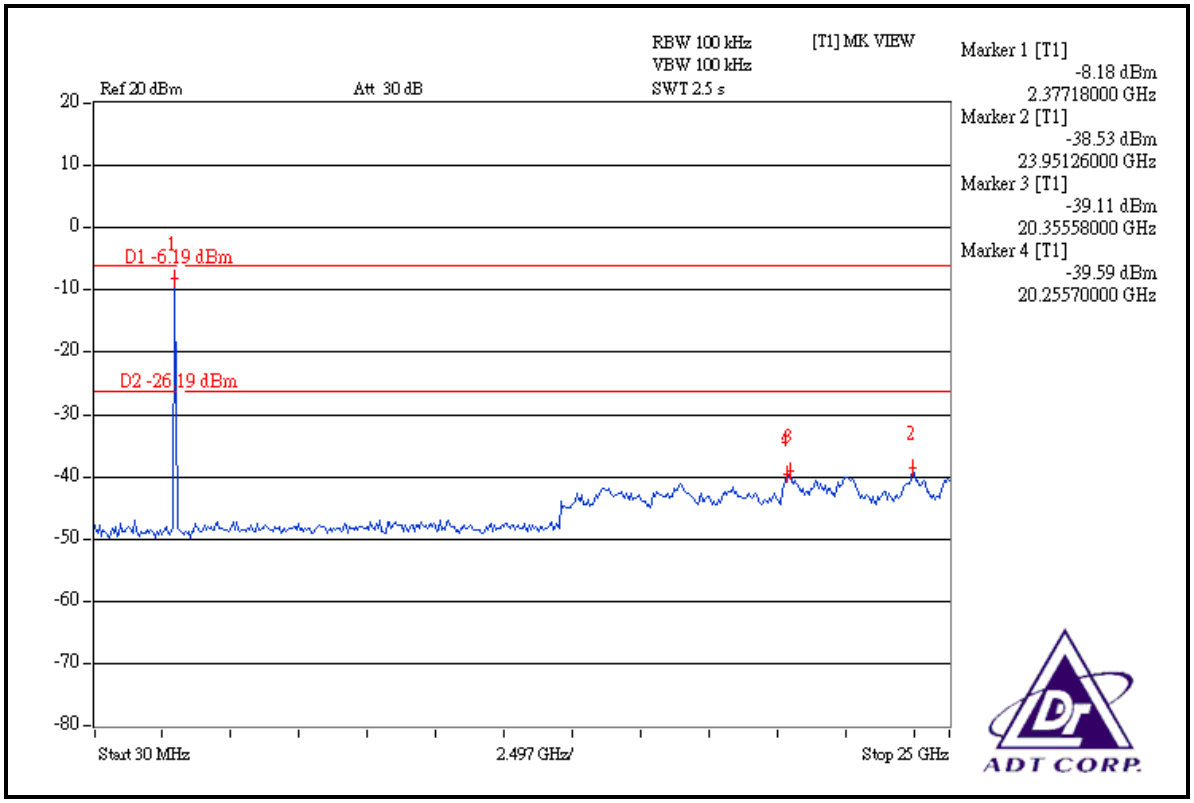
The band edge emission plot on the next second page shows 41.56dBc between carrier maximum power and local maximum emission in restrict band (2.4835GHz). The emission of carrier strength list in the test result of channel 78 at the item 4.2.7 is 87.85dBuV/m (Peak), so the maximum field strength in restrict band is 87.85 – 41.56 = 46.29dBuV/m, which is under 74 dBuV/m limit.

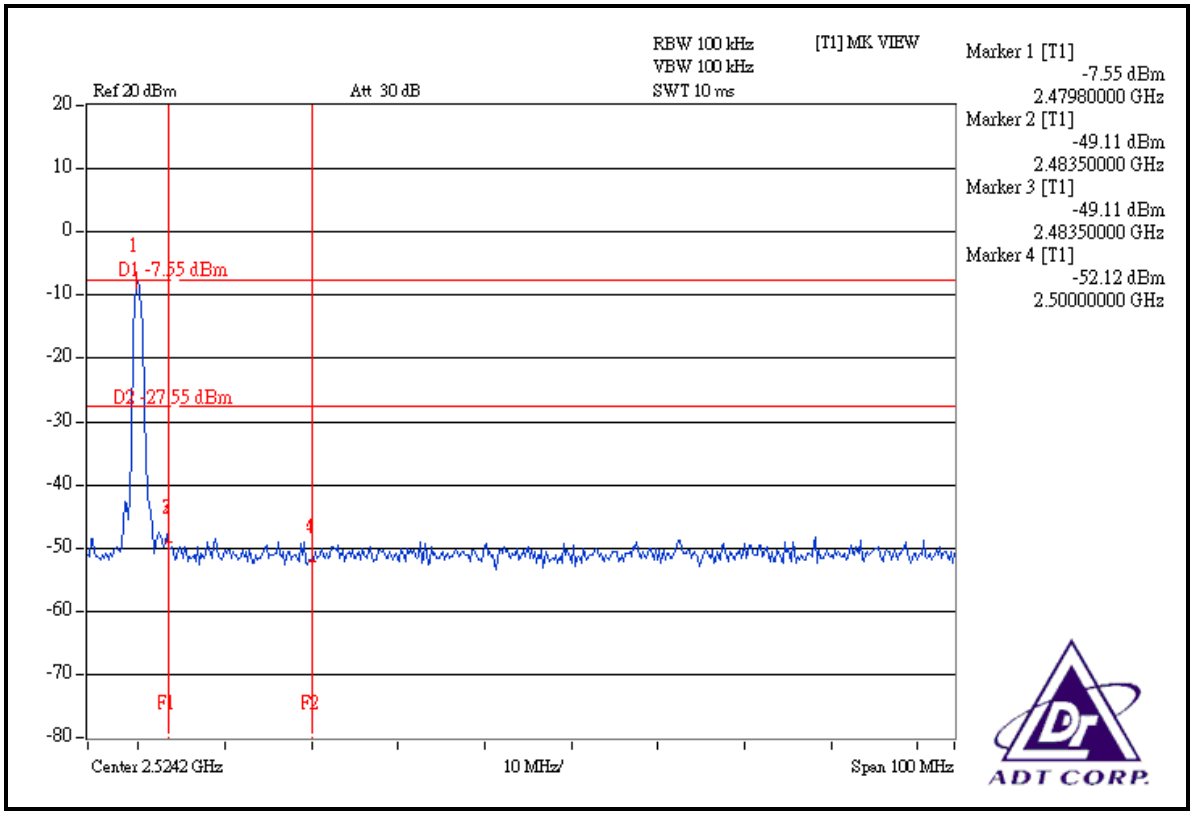
Average value = 46.29 - 30.1= 16.19dBuV/m, which is under 54dBuV/m limit.

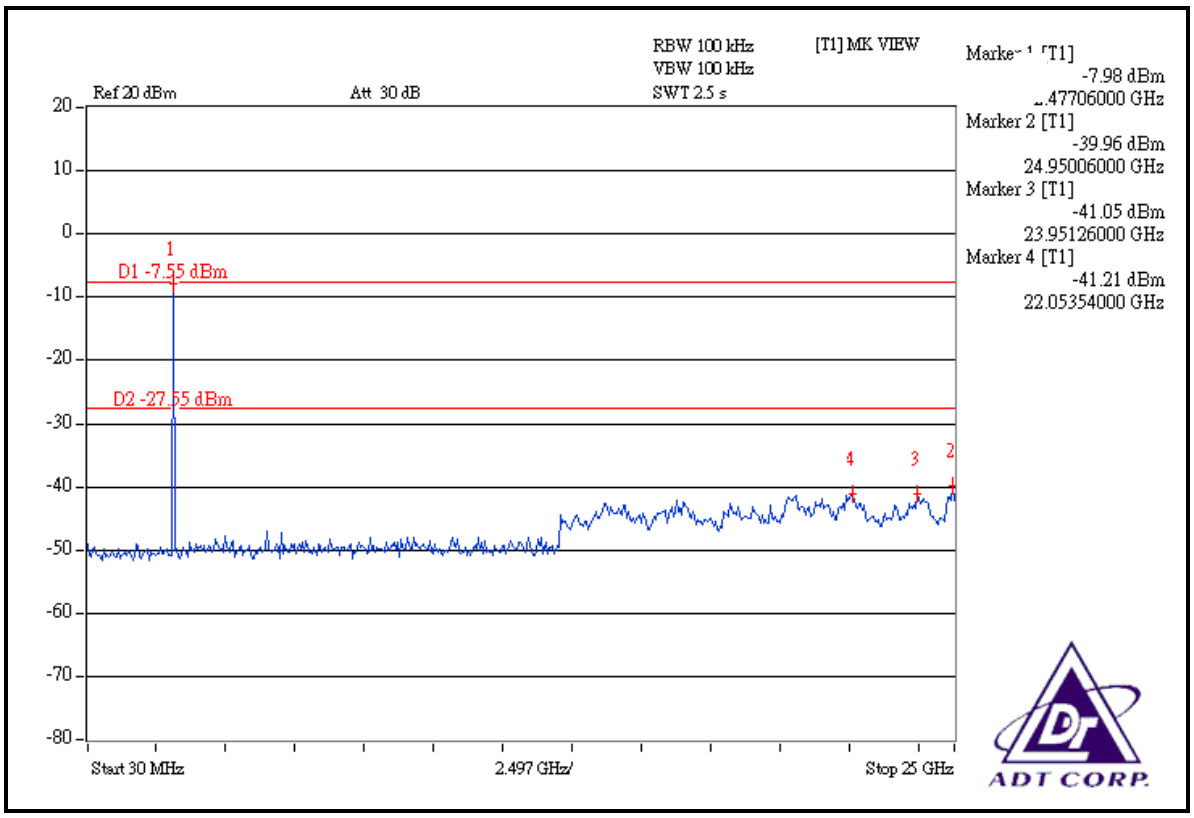
*The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle be equal to: 20log(3.125/100)= -30.1 dB.

Average value = peak reading –30.1.


RBW 100 kHz
VBW 100 kHz
SWT 10 ms
[T1] MK VIEW
Ref 20 dBm
Att 30 dB
D1 -6.19 dBm
D2 -26.19 dBm
Marker 1 [T1]
-6.19 dBm
2.40220000 GHz
Marker 2 [T1]
-50.85 dBm
2.40000000 GHz
Marker 3 [T1]
-48.76 dBm
2.39400000 GHz
Marker 4 [T1]
-50.81 dBm
2.39000000 GHz
Marker 5 [T1]
-48.00 dBm
2.32860000 GHz
Center 2.358 GHz
10 MHz/
Span 100 MHz
ADT CORP.


RBW 100 kHz
VBW 100 kHz
SWT 2.5 s
[T1] MK VIEW
Ref 20 dBm
Att 30 dB
D1 -6.19 dBm
D2 -26.19 dBm
Marker 1 [T1]
-8.18 dBm
2.37718000 GHz
Marker 2 [T1]
-38.53 dBm
23.95126000 GHz
Marker 3 [T1]
-39.11 dBm
20.35558000 GHz
Marker 4 [T1]
-39.59 dBm
20.25570000 GHz
Start 30 MHz
2.497 GHz/
Stop 25 GHz
ADT CORP.


RBW 100 kHz
VBW 100 kHz
SWT 10 ms
[T1] MK VIEW
Ref 20 dBm
Att 30 dB
Marker 1 [T1]
-7.55 dBm
2.47980000 GHz
Marker 2 [T1]
-49.11 dBm
2.48350000 GHz
Marker 3 [T1]
-49.11 dBm
2.48350000 GHz
Marker 4 [T1]
-52.12 dBm
2.50000000 GHz
D1 -7.55 dBm
D2 -27.55 dBm
F1
F2
Center 2.5242 GHz
10 MHz/
Span 100 MHz
ADT CORP.


RBW 100 kHz
VBW 100 kHz
SWT 2.5 s
[T1] MK VIEW
Ref 20 dBm
Att 30 dB
Marker 1 [T1]
-7.98 dBm
.47706000 GHz
Marker 2 [T1]
-39.96 dBm
24.95006000 GHz
Marker 3 [T1]
-41.05 dBm
23.95126000 GHz
Marker 4 [T1]
-41.21 dBm
22.05354000 GHz
D1 -7.55 dBm
D2 -27.55 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz
ADT CORP.

## 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 Chip Antenna without antenna connector. The maximum gain of this antenna is 1.5dBi.

# 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, UL |
| **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---**