# HCT CO., LTD.

## CERTIFICATE OF COMPLIANCE

### FCC Certification

**Applicant Name:**
Pantech Co., Ltd.

**Address:**
DMC I-2, PANTECH R&D Center Sang Am dong,
Mapogu, 121-792, Korea

**Date of Issue:**
March 31, 2011
**Location:**
HCT CO., LTD., 105-1, Jangam-ri, Majang-Myeon, Icheon-si, Kyunggi-Do, Korea
**Test Report No.:** HCTR1103FR17
**HCT FRN:** 0005866421

| | |
|---|---|
| **FCC ID** | **:JYCP5000** |
| **APPLICANT** | **:Pantech Co., Ltd.** |

| | |
|---|---|
| **FCC Model(s):** | P5000 |
| **EUT Type:** | GSM/ WCDMA Phone with Bluetooth |
| **Max. RF Output Power:** | 5.45 dBm(3.51 mW) |
| **Frequency Range:** | 2402 MHz - 2480 MHz (Bluetooth) |
| **Modulation type** | GFSK(Normal), PSK(EDR) |
| **FCC Classification:** | FCC Part 15 Spread Spectrum Transceiver |
| **FCC Rule Part(s):** | Part 15 subpart C 15.247 |

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

**HCT CO., LTD.** Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

Jong Seok Lee

**Report prepared by**
**: Jong Seok Lee**
**Test Engineer of RF Team**

**Approved by**
**: Sang Jun Lee**
**Manager of RF Team**

# Version

| TEST REPORT NO. | DATE | DESCRIPTION |
|---|---|---|
| HCTR1103FR17 | March 31, 2011 | First Approval Report |
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# 1. GENERAL INFORMATION

| | |
|---|---|
| **Applicant Name:** | Pantech Co., Ltd. |
| **Address:** | DMC I-2, PANTECH R&D Center Sang Am dong, Mapogu, 121-792, Korea |
| **FCC ID:** | JYCP5000 |
| **EUT:** | GSM/ WCDMA Phone with Bluetooth |
| **Model name(s):** | P5000 |
| **Date(s) of Tests:** | March 23, 2011 ~ March 30, 2011 |
| **Contact Person:** | Name: Sam Seok Yoon<br>Phone #: +82-2-2030-1335<br>Fax #: +82-2-3660-5990 |
| **Place of Tests:** | HCT Co., Ltd.<br>105-1, Jangam-ri , Majang-Myeon, Icheon-si, Kyunggi-Do, 467-811, KOREA.<br>(IC Recognition No. : 5944A-2) |

# 2. EUT DESCRIPTION

| | |
|---|---|
| **EUT Type** | GSM/ WCDMA Phone with Bluetooth |
| **FCC Model Name** | P5000 |
| **Power Supply** | DC 3.7 V |
| **Battery Type** | Li-ion Battery(standard) |
| **Frequency Range** | 2402 MHz - 2480 MHz (Bluetooth) |
| **Transmit Power** | 5.45 dBm(3.51 mW) |
| **Modulation Type** | GFSK(Normal), PSK(EDR) |
| **Modulation Technique** | FHSS |
| **Number of Channels** | 79Channels |
| **Antenna Specification** | Manufacturer: Pantech Co., Ltd.<br>Antenna type: PCB pattern Antenna<br>Peak Gain : 0.96 dBi |

**※ 15.247 Requirements for Bluetooth transmitter**

▪ This Bluetooth module has been tested by a Bluetooth Qualification Lab, and we confirm the following:

1) This system is hopping pseudorandomly.

2) Each frequency is used equally on the average by each transmitter.

3) The receiver input bandwidths that match the hopping channel bandwidths of their corresponding transmitters

4) The receiver shifts frequencies in synchronization with the transmitted signals.

▪ 15.247(g): The system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this Section 15.247 should the transmitter be presented with a continuous data (or information) stream.

▪ 15.247(h): The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

# 3. TEST METHODOLOGY

The measurement procedure described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz(ANSI C63.4-2003) and FCC Public Notice DA 00-705 dated March 30, 2000 entitled “Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems” were used in the measurement of the **Pantech Co., Ltd.**
**GSM/ WCDMA Phone with Bluetooth FCC ID: JYCP5000**

## 3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

## 3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

## 3.3 GENERAL TEST PROCEDURES

**Conducted Emissions**

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4. (Version :2003) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

**Radiated Emissions**

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4. (Version: 2003)

## 3.4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.
Channel low, mid and high with highest data rate (worst case) is chosen for full testing.

# 4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

# 5. FACILITIES AND ACCREDITATIONS

## 5.1 FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 105-1, Jangam-ri, Majang-Myeon, Icheon-si, Kyunggi-Do, 467-811, Korea. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2003) and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated June 10, 2009 (Registration Number: 90661)

## 5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

# 6. ANTENNA REQUIREMENTS

**According to FCC 47 CFR §15.203:**

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

* The antennas of this E.U.T are permanently attached.

*The E.U.T Complies with the requirement of §15.203

# 7. FCC PART 15.247 REQUIREMENTS

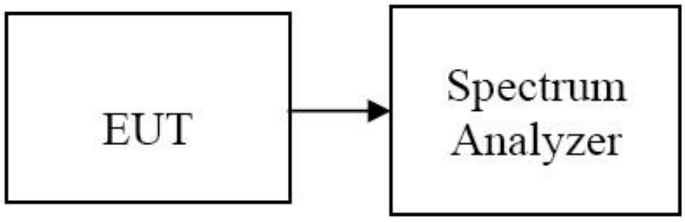
## 7.1 PEAK POWER

**LIMIT**

The maximum peak output power of the intentional radiator shall not exceed the following:

1. For systems using digital modulation in the bands of 902 ~ 928 MHz, 2400 ~ 2483.5 MHz, and 5725 ~ 5850 MHz: 1 watt.
2. Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

**Test Configuration**




**TEST PROCEDURE**

The transmitter output is connected to the Spectrum Analyzer. The Spectrum Analyzer is set to the peak detector mode.

1. Span = 2 MHz (GFSK) / 5 MHz (8DPSK)
2. RBW = 1 MHz (GFSK) / 3 MHz (8DPSK)
3. VBW = 1 MHz (GFSK) / 3 MHz (8DPSK)
4. Sweep = auto
5. Packet type= DH5 (GFSK) / 3-DH5 (8DPSK)

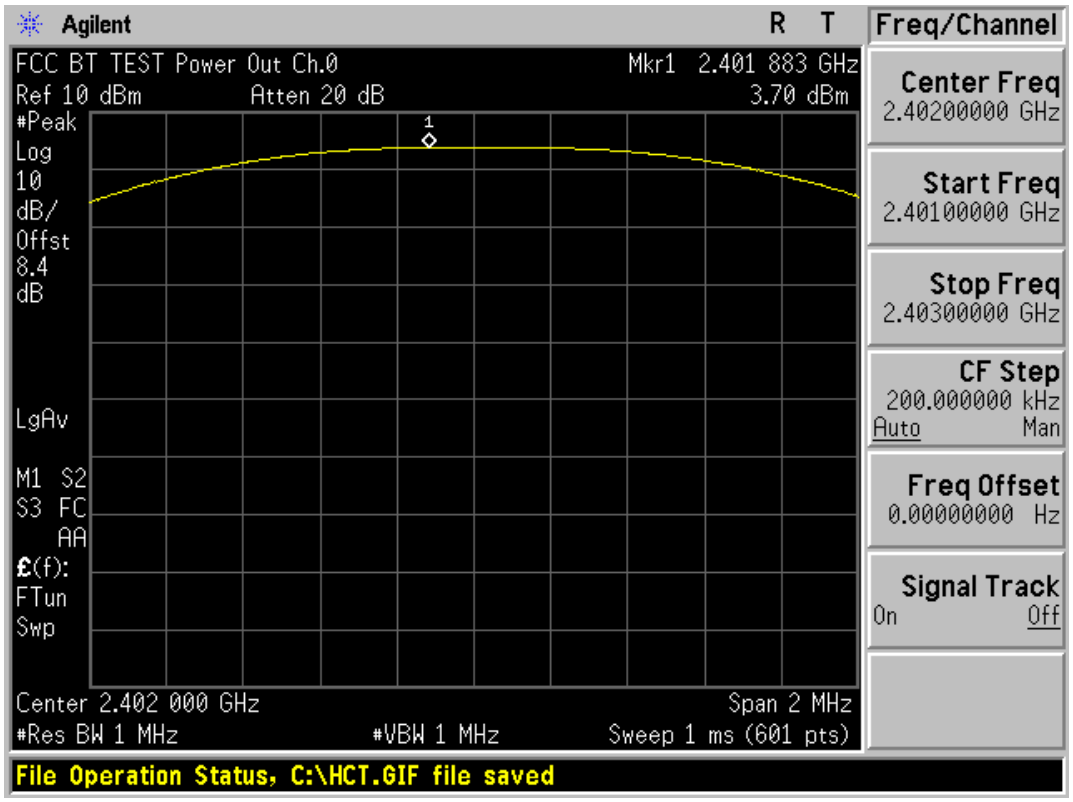
**TEST RESULTS**

No non-compliance noted

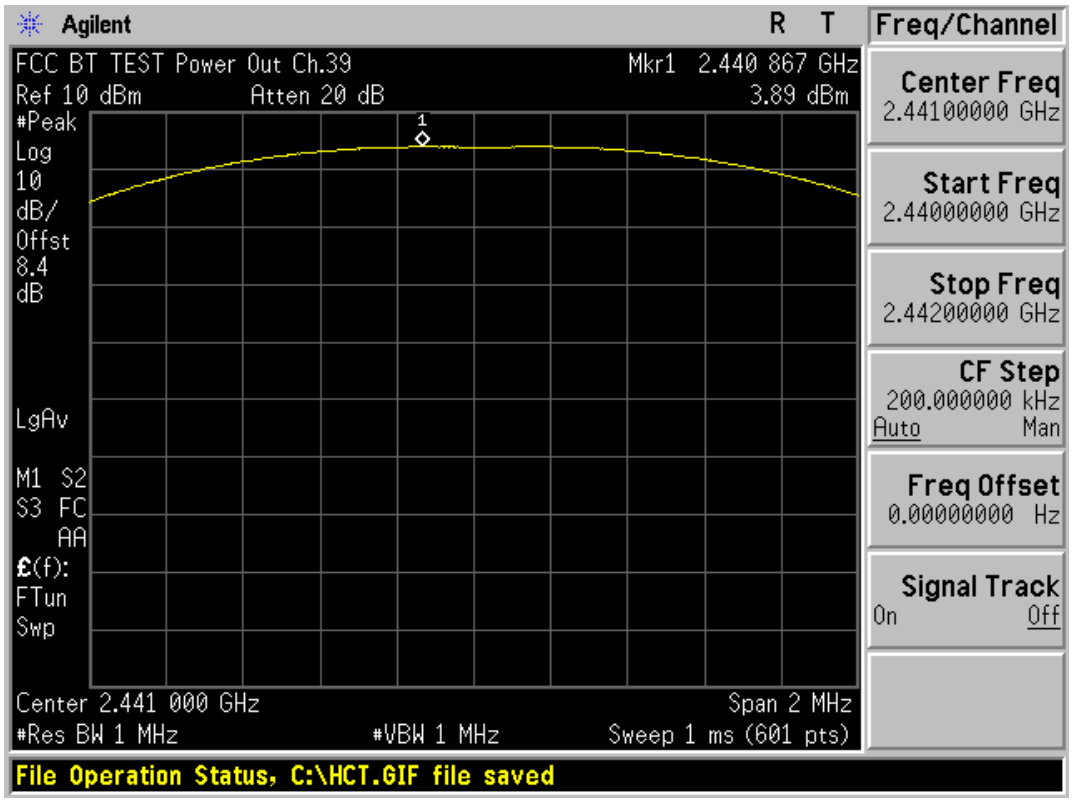
**Test Data**

| Channel | Frequency (MHz) | Output Power(GFSK) | | Output Power(8DPSK) | | Limit (W) | Result |
|---|---|---|---|---|---|---|---|
| | | (dBm) | (mW) | (dBm) | (mW) | | |
| Low | 2402 | 3.70 | 2.34 | 5.01 | 3.17 | 1 | PASS |
| Mid | 2441 | 3.89 | 2.45 | 5.20 | 3.31 | | PASS |
| High | 2480 | 4.19 | 2.62 | 5.45 | 3.51 | | PASS |

Test Plots (GFSK)
Peak Power (Low-CH)

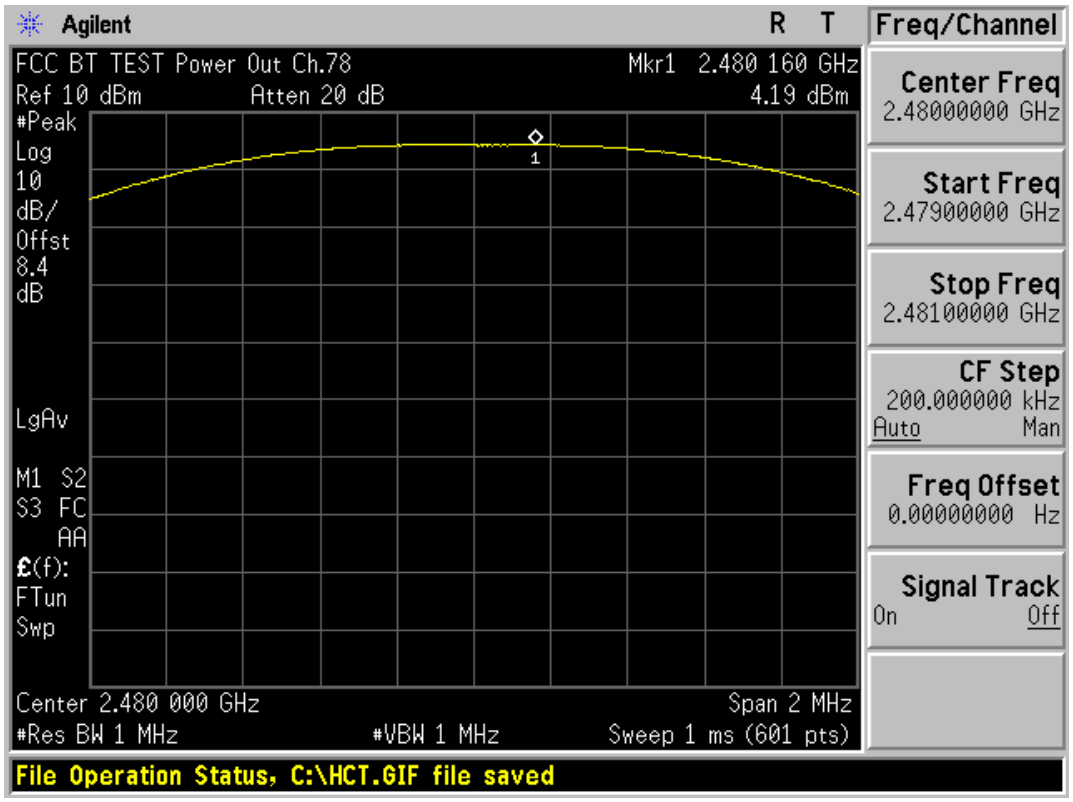



Test Plots (GFSK)
Peak Power (Mid-CH)



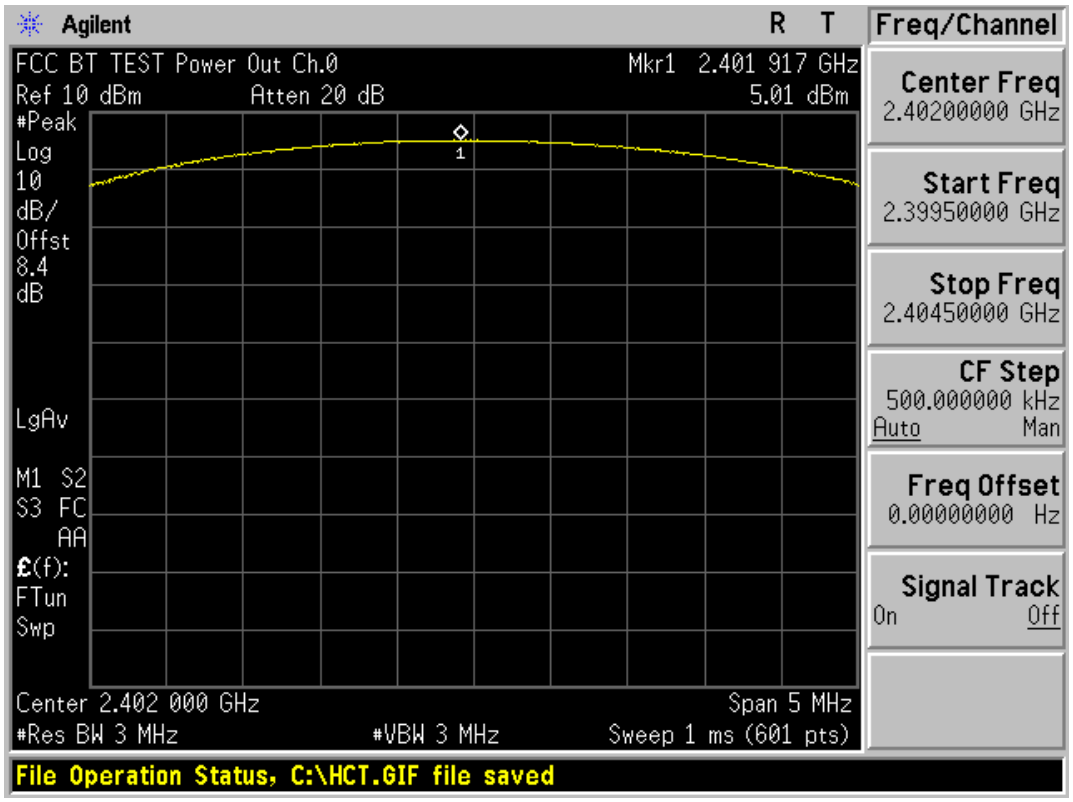
Test Plots (GFSK)

Peak Power (High-CH)

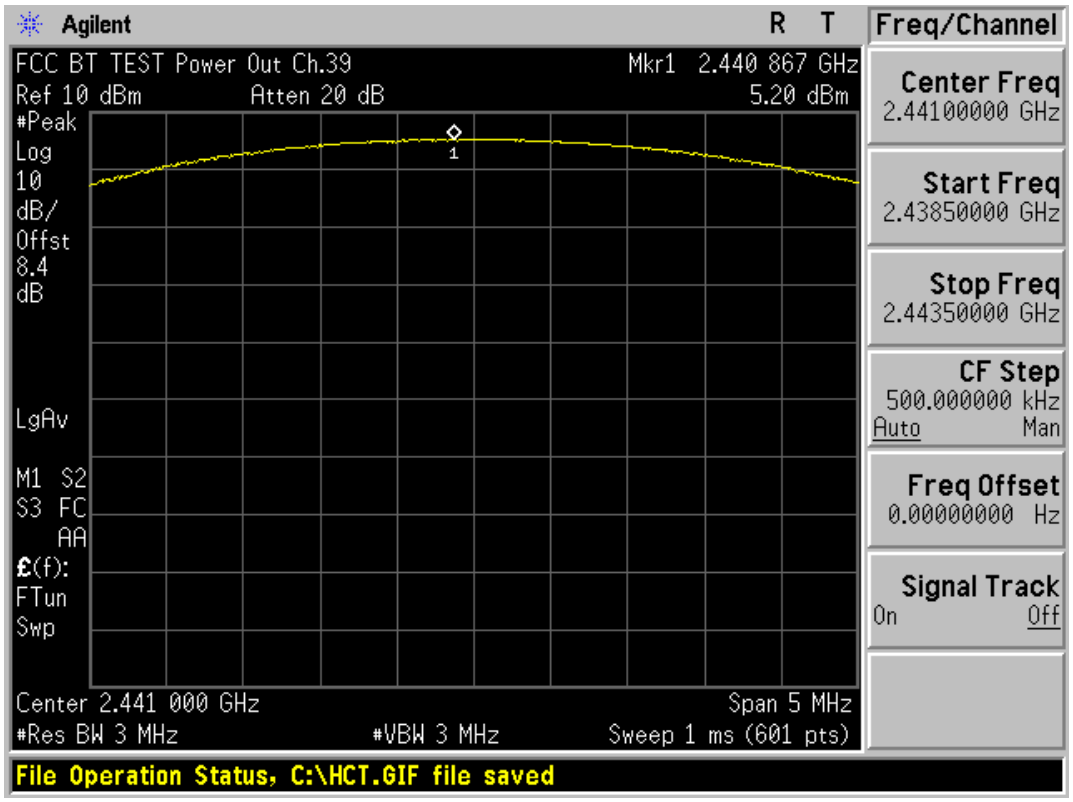



Test Plots (8DPSK)

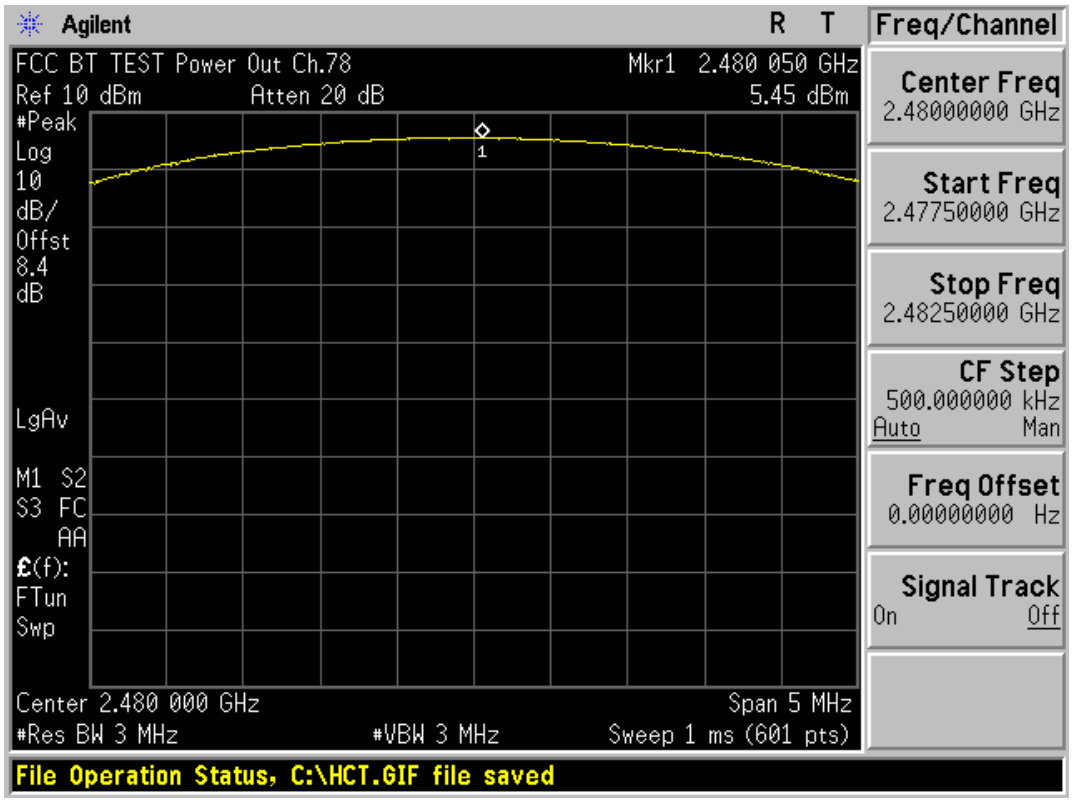
Peak Power (Low-CH)



Test Plots (8DPSK)
Peak Power (Mid-CH)




Test Plots (8DPSK)
Peak Power (High-CH)

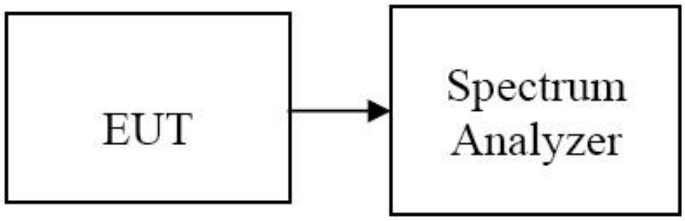


## 7.2 BAND EDGES MEASUREMENT

**LIMIT**

According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

**Test Configuration**




**TEST PROCEDURE**

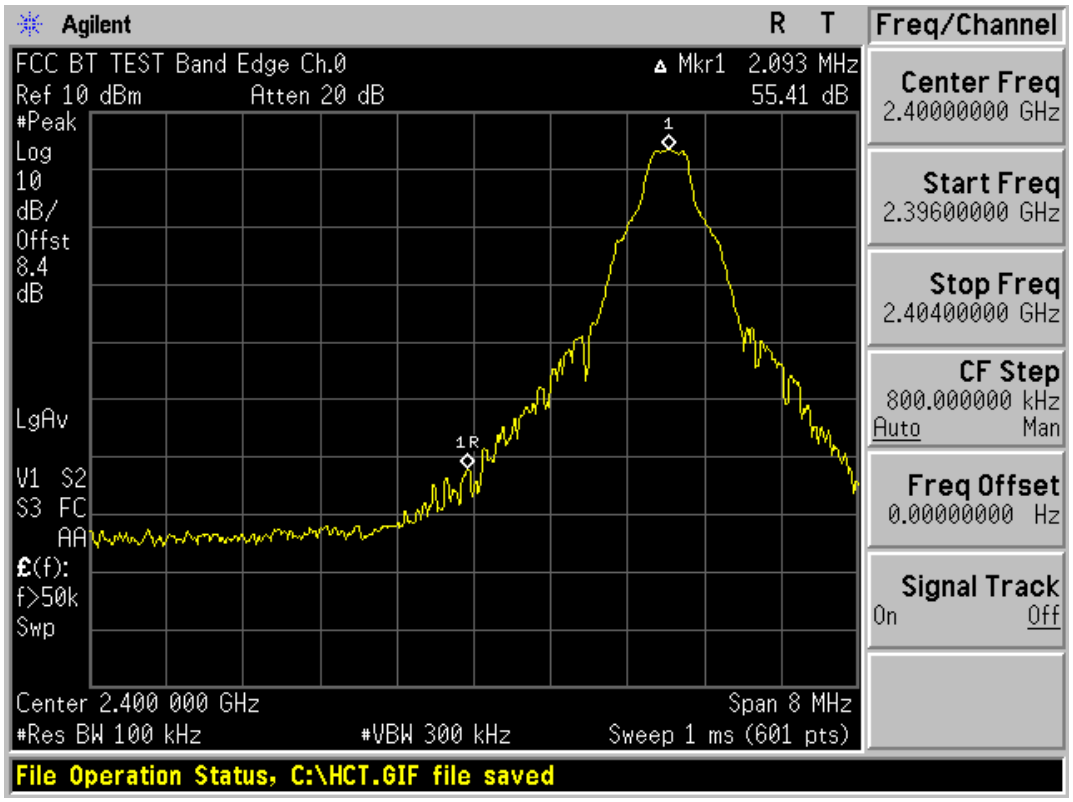
The spectrum analyzer is set to :

1. Span = 8 MHz
2. RBW = 100 kHz
3. VBW = 300 kHz
4. Sweep = auto
5. Detector Mode = Peak

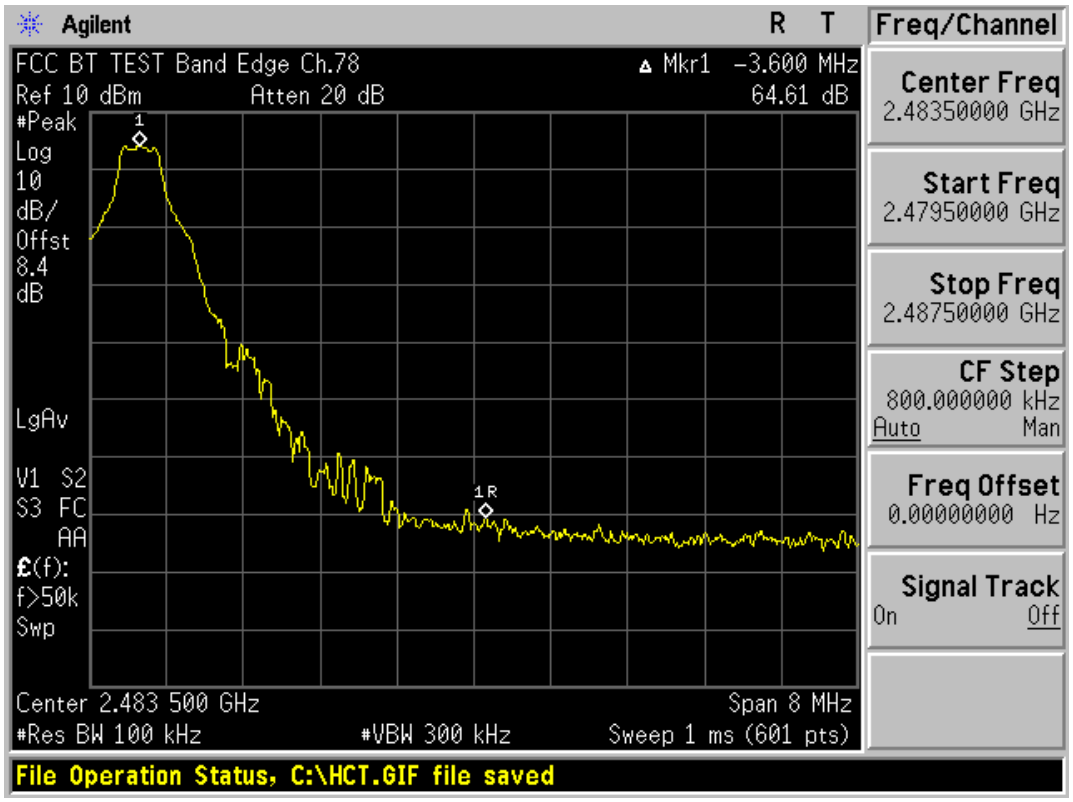
**TEST RESULTS**

See attached.

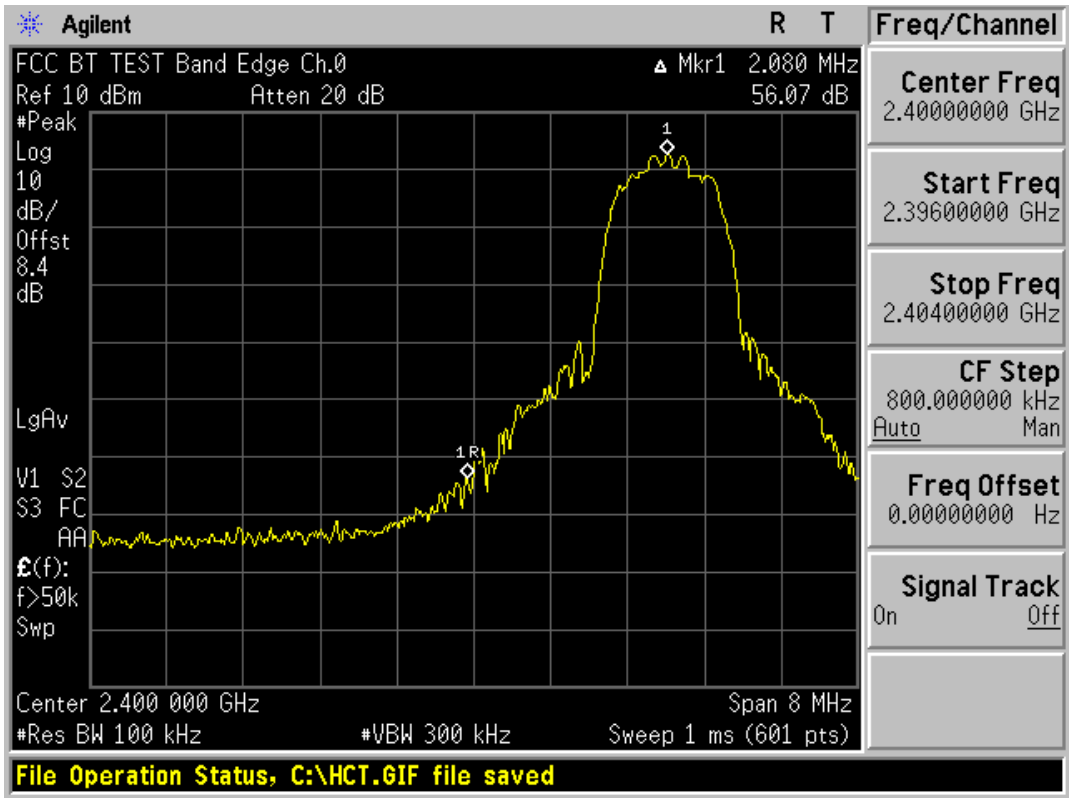
Test Plots (GFSK)
Band Edges (Low-CH)



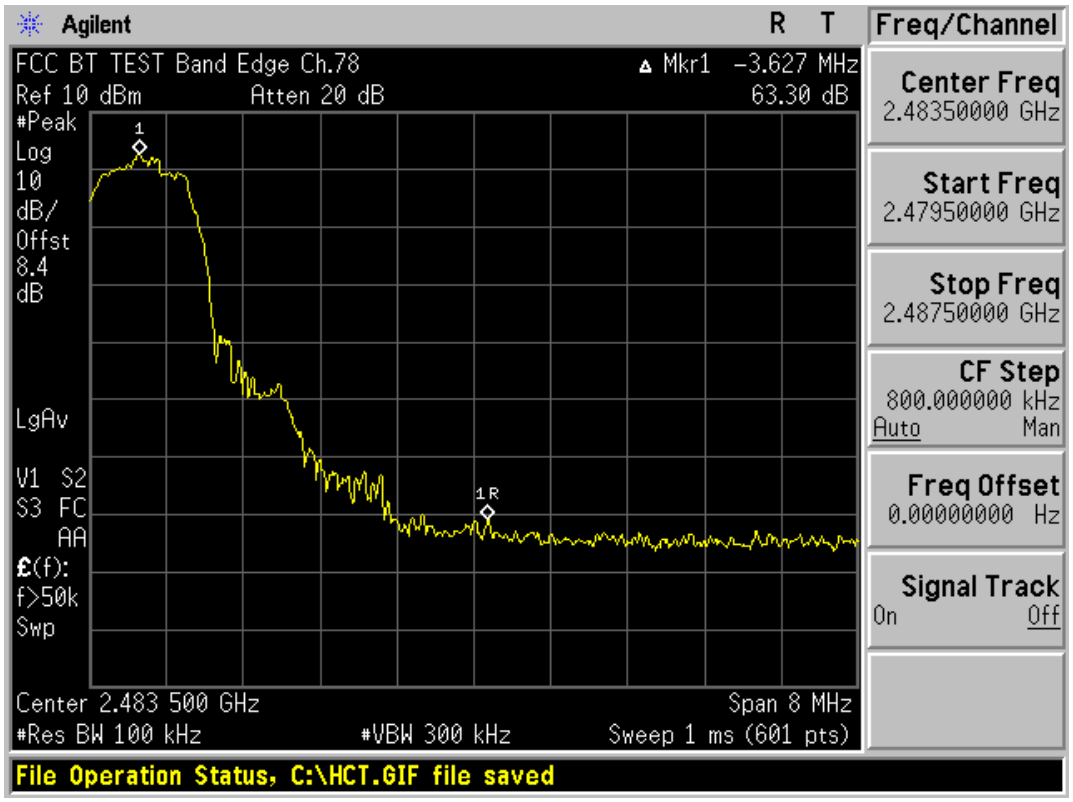

Test Plots (GFSK)
Band Edges (High-CH)



Test Plots (8DPSK)
Band Edges (Low-CH)




Test Plots (8DPSK)
Band Edges (High-CH)

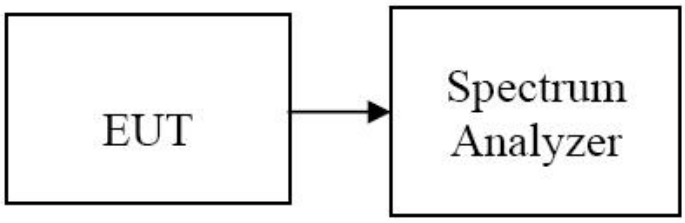


## 7.3 FREQUENCY SEPARATION / OCCUPIED BANDWIDTH (99% BW)

**LIMIT**

According to §15.247(a)(1), Frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

**Test Configuration**




**TEST PROCEDURE**

The spectrum analyzer is set to :

1. Span = 3 MHz
2. RBW = 30 kHz
3. VBW = 100 kHz
4. Sweep = auto

The trace was allowed to stabilize. The marker-delta function was used to determine the separation between the peaks of the adjacent channels.

**TEST RESULTS**

No non-compliance noted

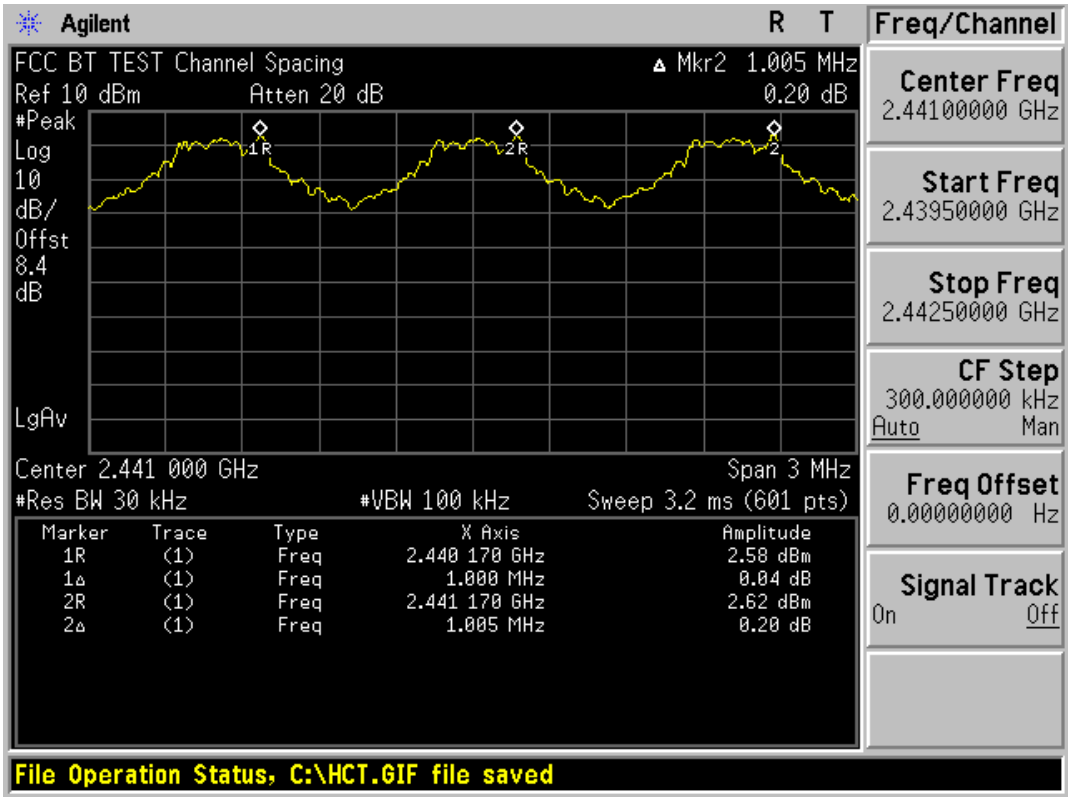
**Test Data**

| Channel Separation (kHz) | | 20dB Bandwidth (kHz) | | | Limit (kHz) | Result |
|---|---|---|---|---|---|---|
| GFSK | 8DPSK | Channel | GFSK | 8DPSK | | |
| 1000 | 1090 | Low CH | 951.9 | 1292.0 | >25 or >2/3 of the 20dB BW | Pass |
| | | Middle CH | 949.6 | 1280.0 | | |
| | | High CH | 952.8 | 1292.0 | | |

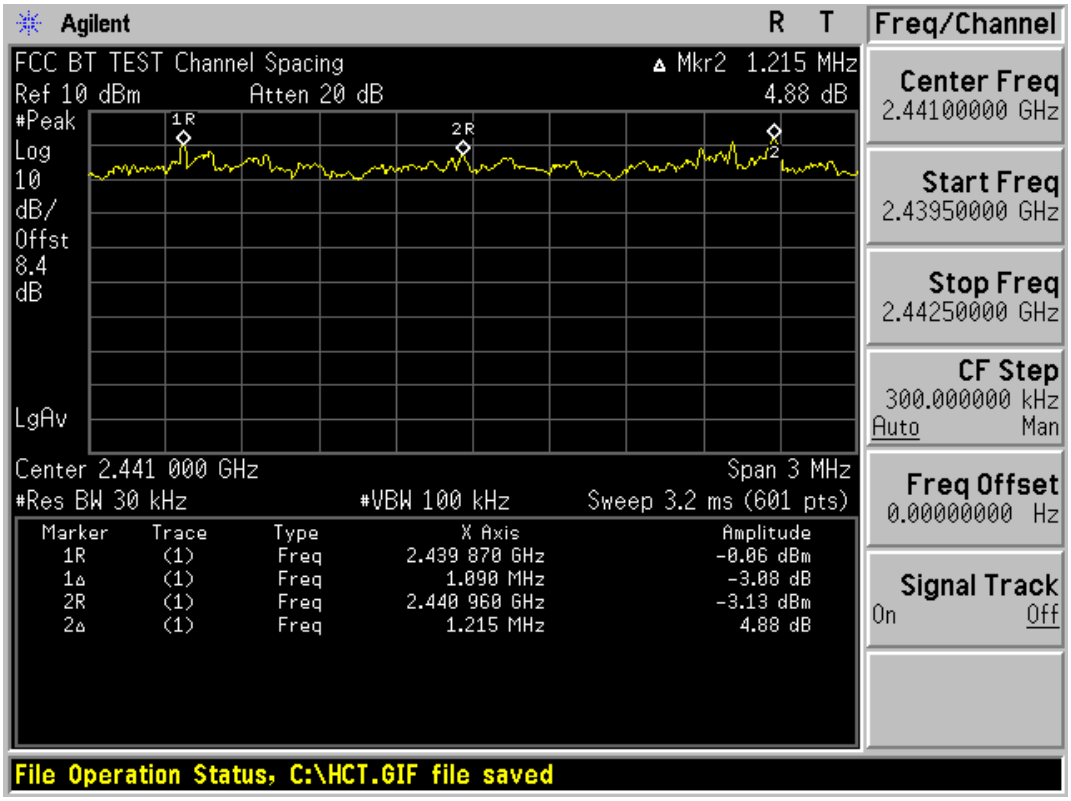
**Occupied Bandwidth (99% BW )**

| 99% BW (kHz) | | | Result |
|---|---|---|---|
| Channel | GFSK | 8DPSK | |
| Low CH | 906.0 | 1174.3 | Pass |
| Middle CH | 910.5 | 1165.6 | |
| High CH | 907.8 | 1174.6 | |

Test Plots (GFSK)
Channel Separation

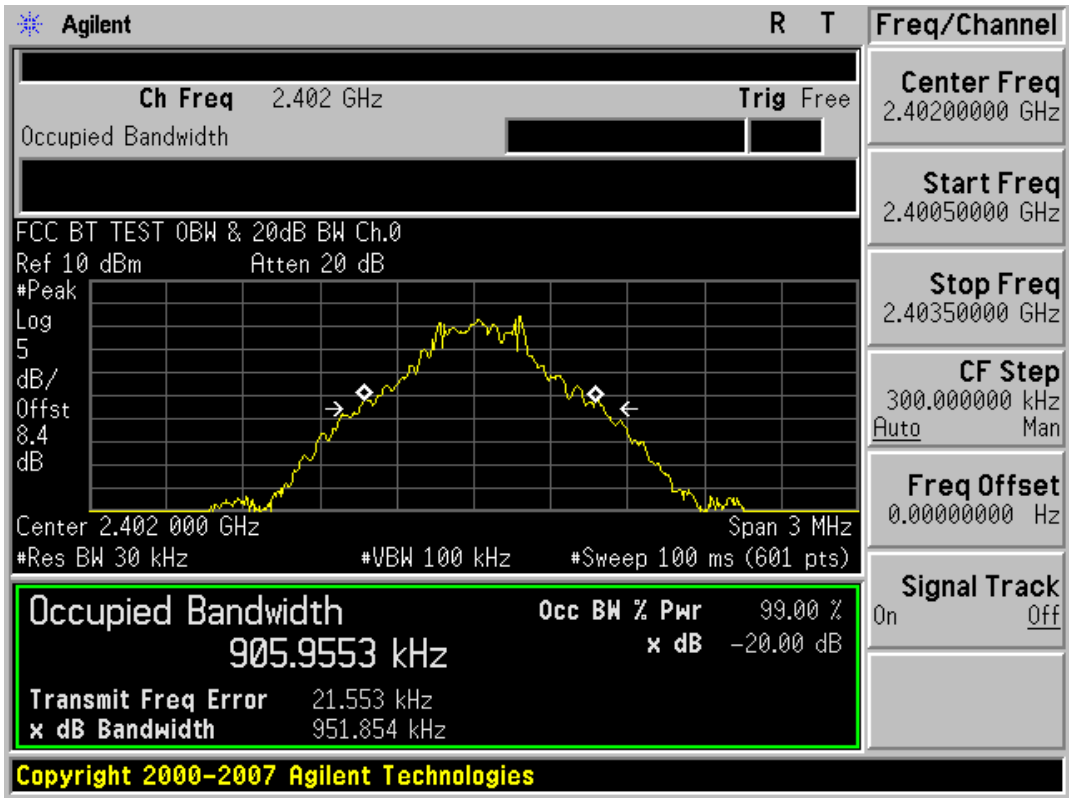



Test Plots (8DPSK)
Channel Separation



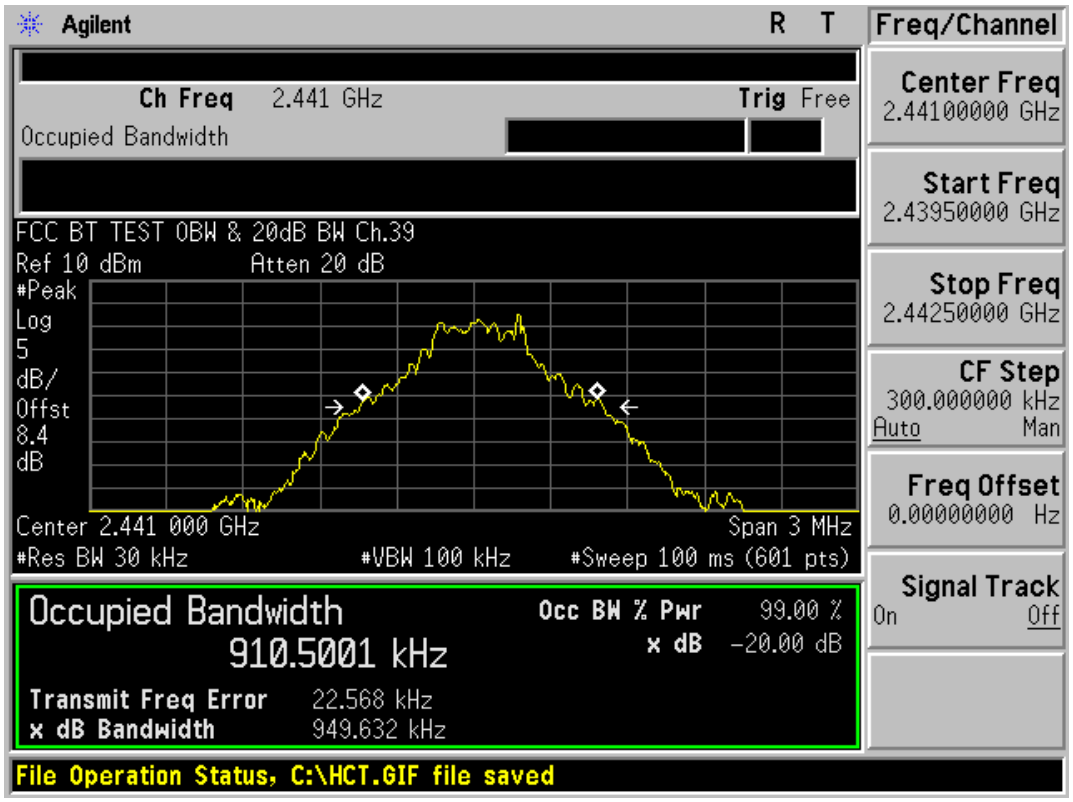
Test Plots (GFSK)

20 dB Bandwidth & Occupied Bandwidth (Low-CH)



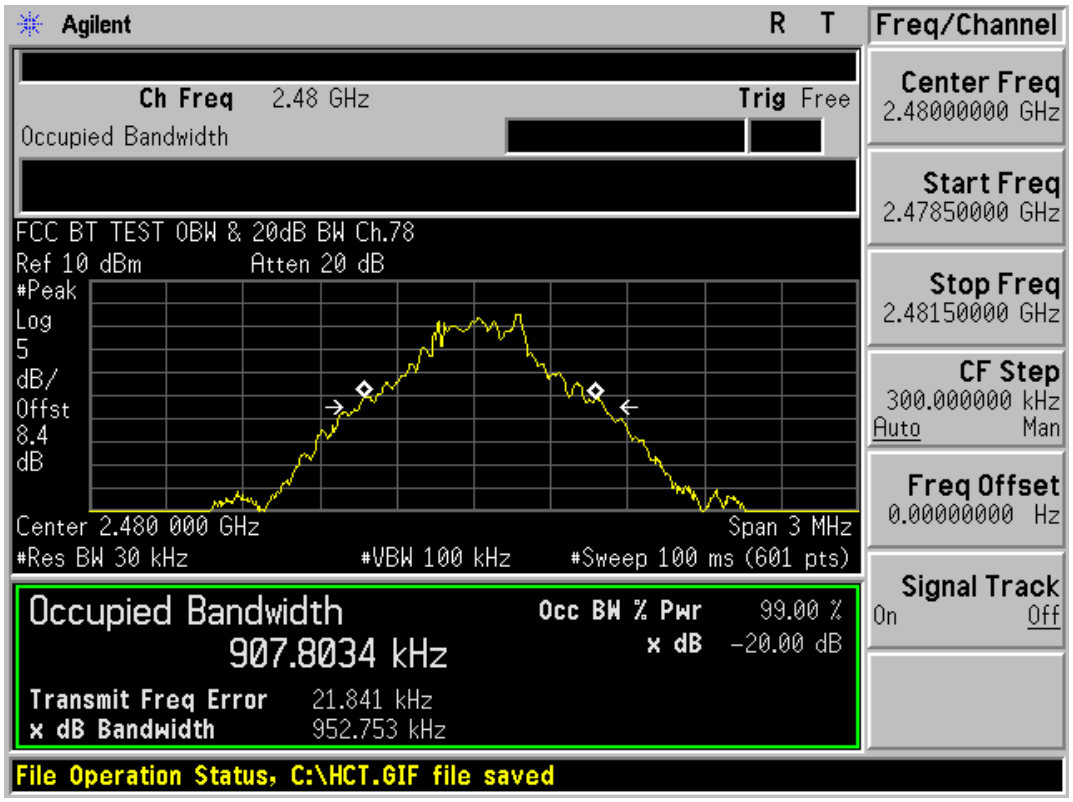

Test Plots (GFSK)

20 dB Bandwidth & Occupied Bandwidth (Mid-CH)



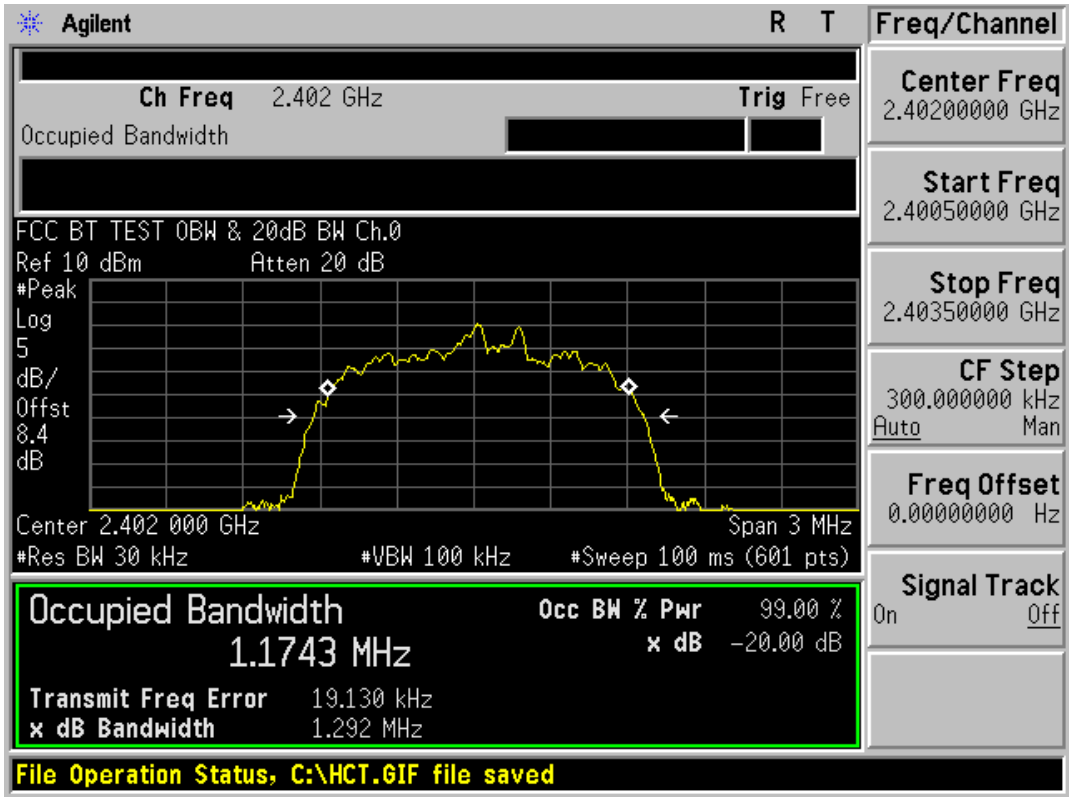
Test Plots (GFSK)

20 dB Bandwidth & Occupied Bandwidth (High-CH)

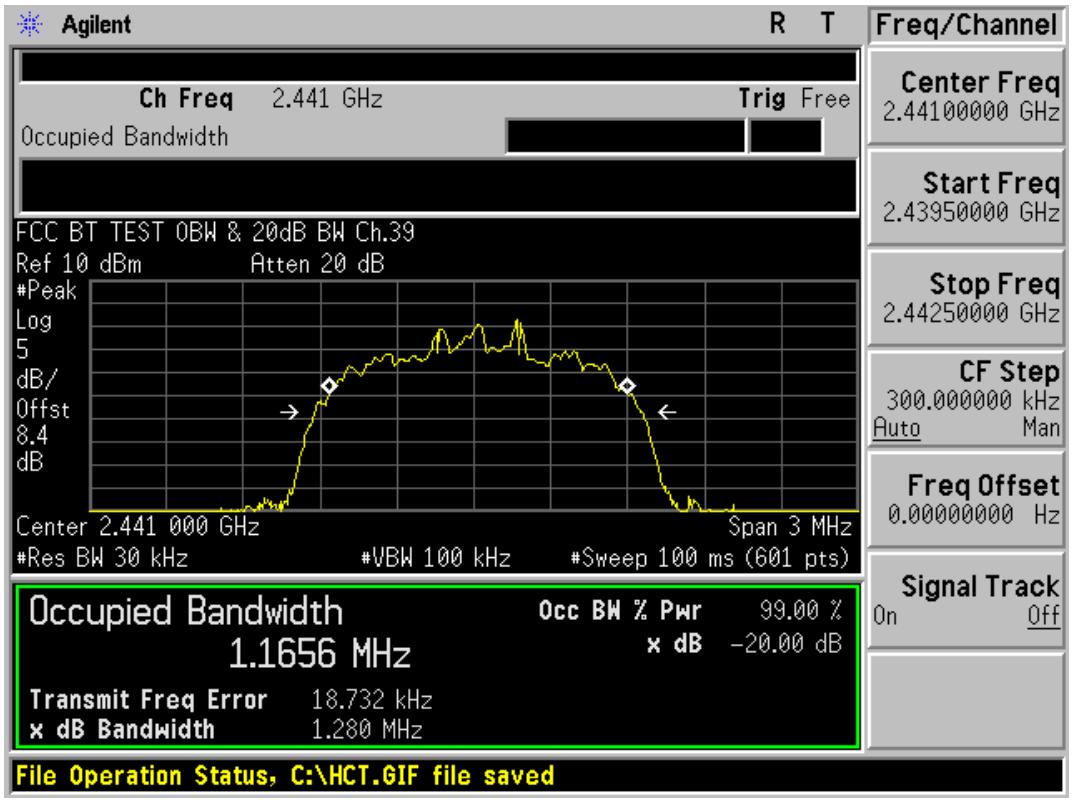



Test Plots (8DPSK)

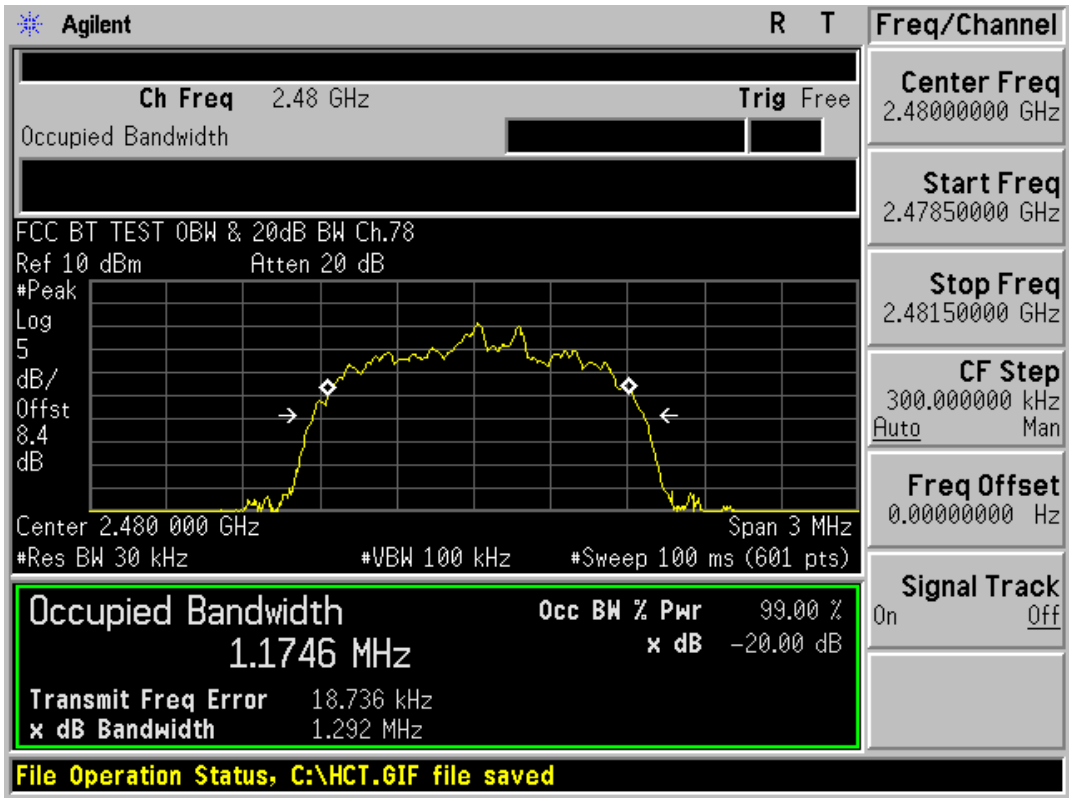
20 dB Bandwidth & Occupied Bandwidth (Low-CH)



Test Plots (8DPSK)
20 dB Bandwidth & Occupied Bandwidth (Mid-CH)




Test Plots (8DPSK)
20 dB Bandwidth & Occupied Bandwidth (High-CH)

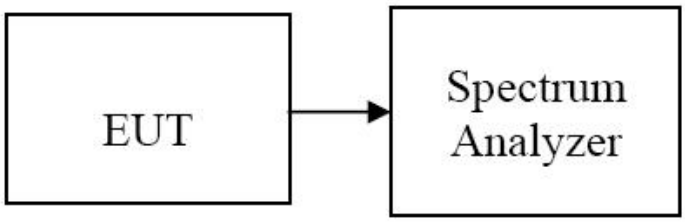


## 7.4 NUMBER OF HOPPING FREQUENCY

**LIMIT**

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400 MHz ~ 2483.5 MHz bands shall use at least 15 hopping frequencies.

**Test Configuration**




**TEST PROCEDURE**

The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer was set to :

1. Span = the frequency band of operation ( Start = 2400 MHz, Stop = 2483.5 MHz )
2. RBW = 300 kHz
3. VBW = 300 kHz
4. Sweep = auto

The trace was allowed to stabilize.

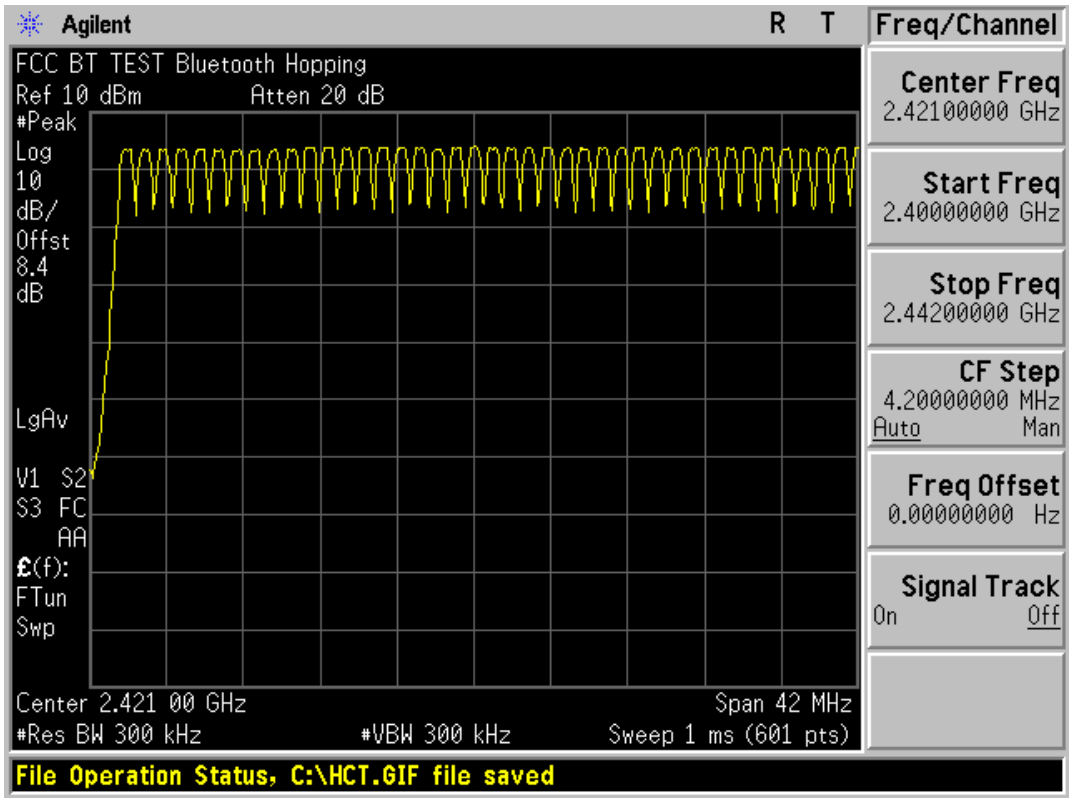
**TEST RESULTS**

No non-compliance noted

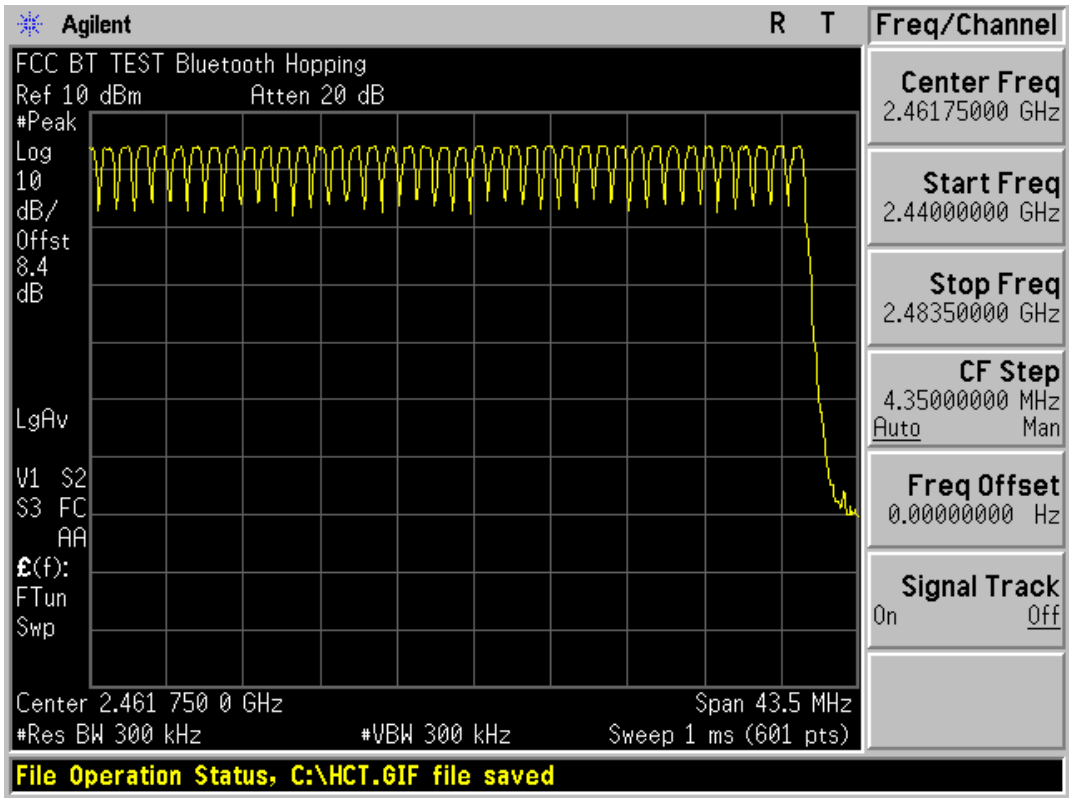
**Test Data**

| Result (No. of CH) | | Limit | Result |
|---|---|---|---|
| GFSK | 8DPSK | | |
| 79 | 79 | >15 | Pass |

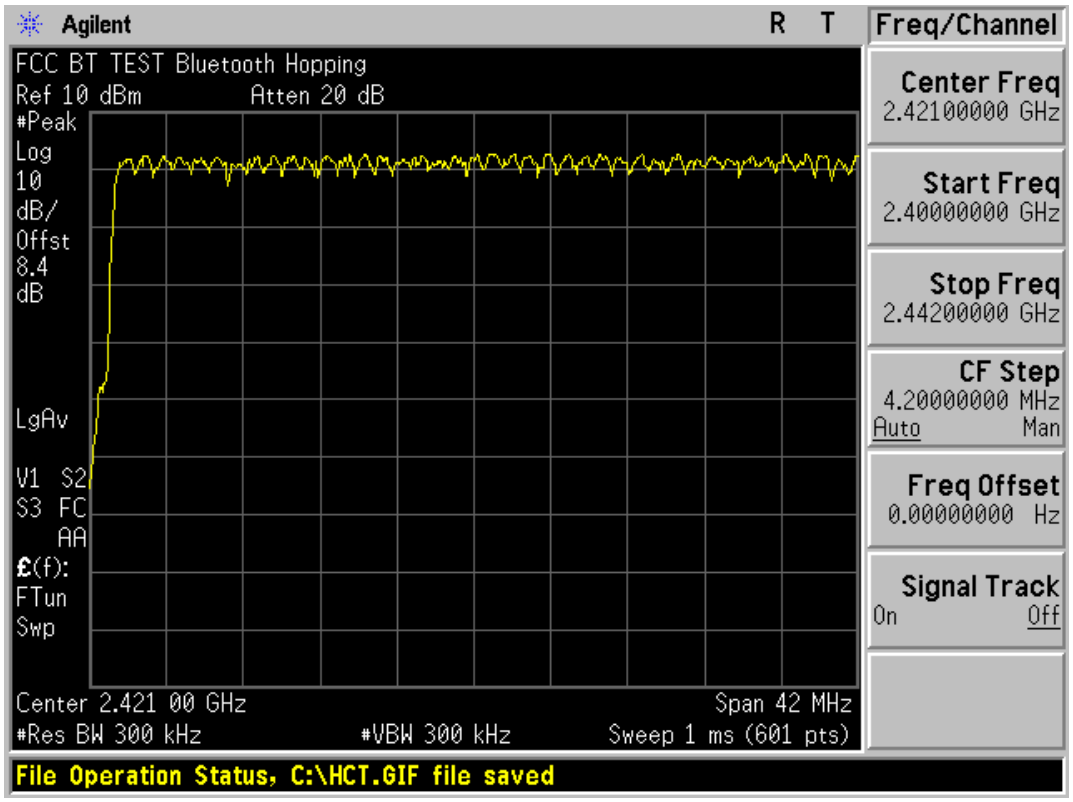
Test Plots (GFSK)
Number of Channels (2.4 GHz - 2.441 GHz)



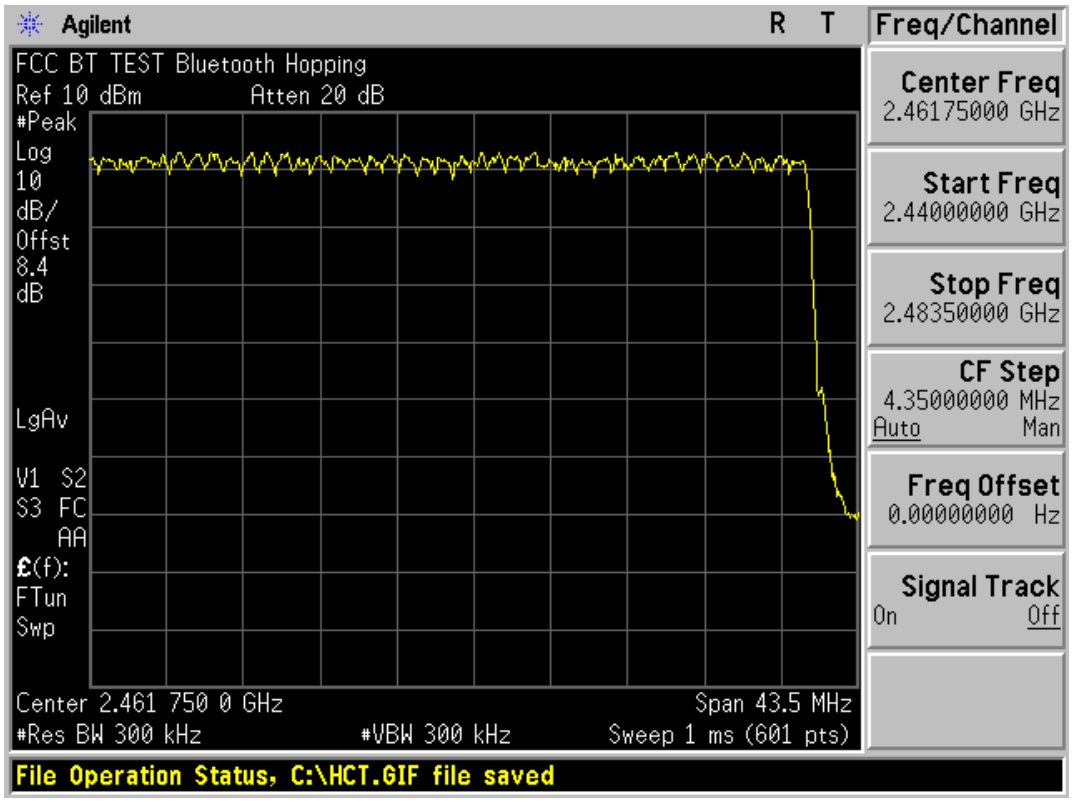

Test Plots (GFSK)
Number of Channels (2.441 GHz - 2.4835 GHz)



Test Plots (8DPSK)
Number of Channels (2.4 GHz - 2.441 GHz)




Test Plots (8DPSK)
Number of Channels (2.441 GHz - 2.4835 GHz)

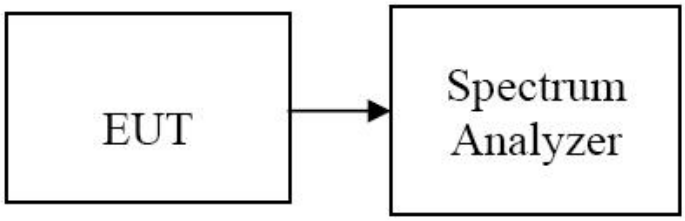


## 7.5 TIME OF OCCUPANCY (DWELL TIME)

### LIMIT

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400 MHz ~ 2483.5 MHz bands. The average time of occupancy on any channels shall not greater than 0.4 s within a period 0.4 s multiplied by the number of hopping channels employed.

### Test Configuration




### TEST PROCEDURE

EUT was set to transmit the longest packet type (DH5)

1. Span = zero span
2. RBW = 1 MHz
3. VBW = 1 MHz
4. Sweep = as necessary to capture the entire dwell time per channel

The marker-delta function was used to determine the dwell time.

### TEST RESULTS

See the table.

**DH 5**(The longest packet type for GFSK)

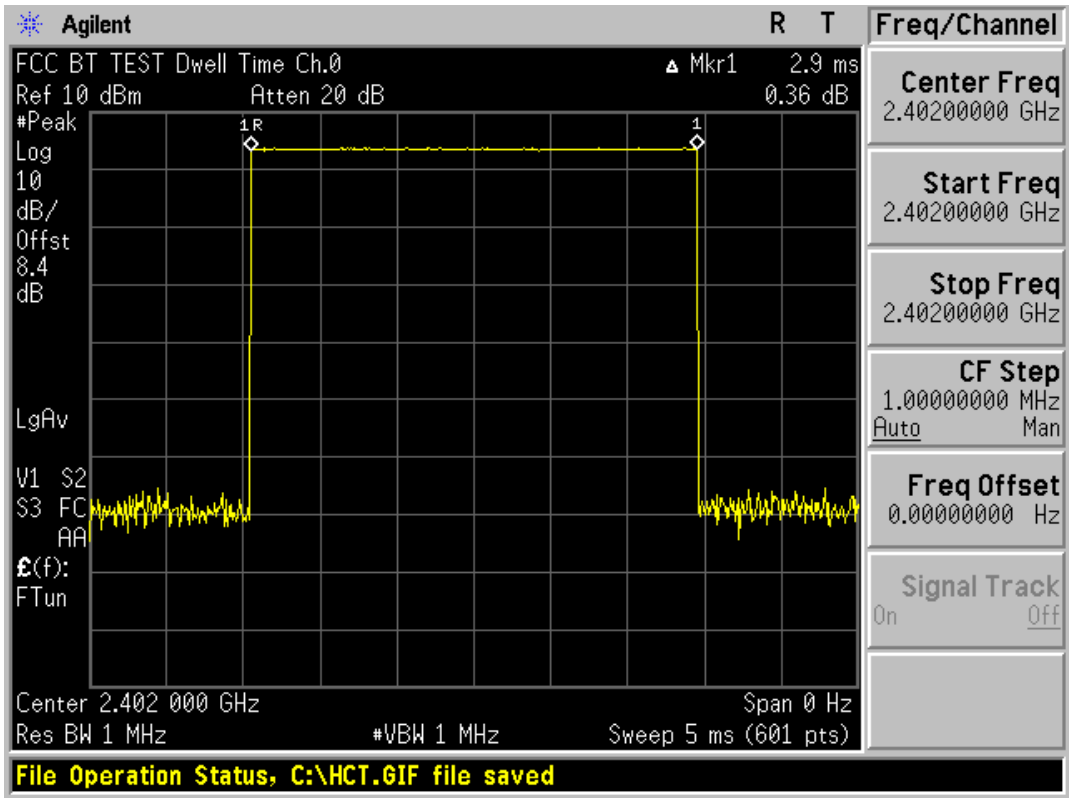
CH Mid : 2.89 * (1600/6)/79 * 31.6 = 308.27 (ms)

**3-DH 5**(The longest packet type for 8DPSK)

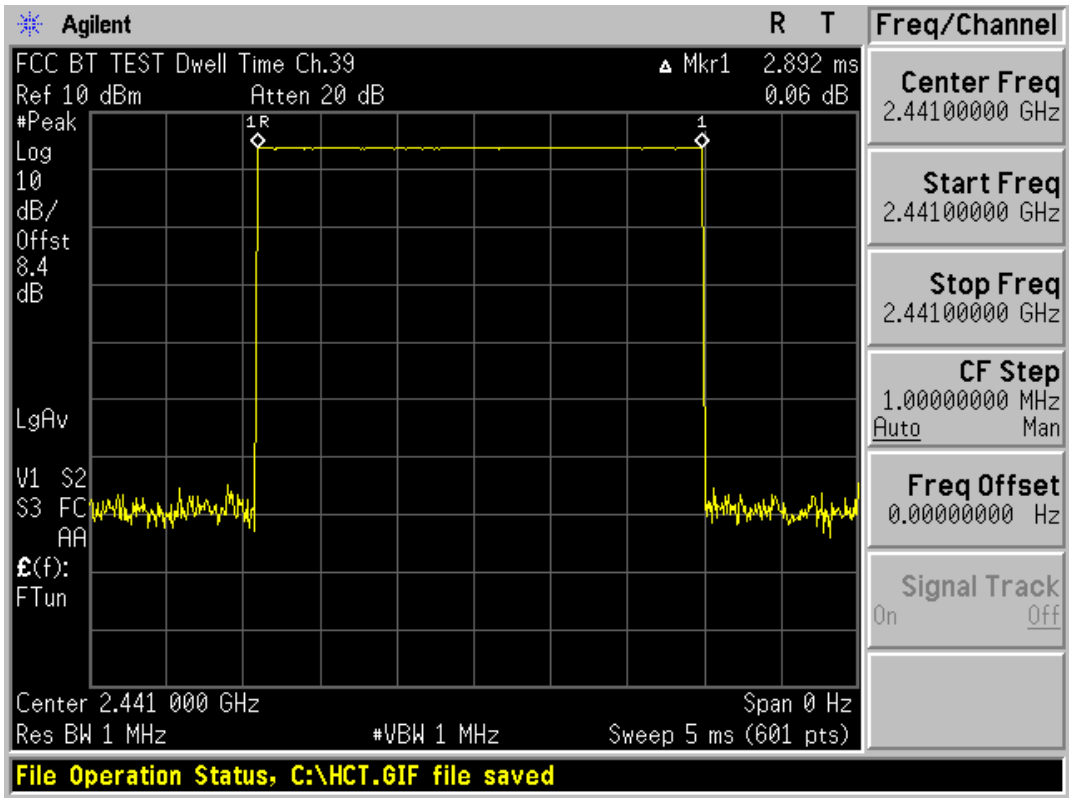
CH Mid : 2.90 * (1600/6)/79 * 31.6 = 309.33 (ms)

| Channel | Pulse Time (ms) | | Total of Dwell (ms) | | Period Time (s) | Limit (ms) | Result |
|---|---|---|---|---|---|---|---|
| | GFSK | 8DPSK | GFSK | 8DPSK | | | |
| Low | 2.90 | 2.90 | 309.33 | 309.33 | 31.6 | 400 | PASS |
| Mid | 2.89 | 2.90 | 308.27 | 309.33 | 31.6 | | PASS |
| High | 2.89 | 2.90 | 308.27 | 309.33 | 31.6 | | PASS |

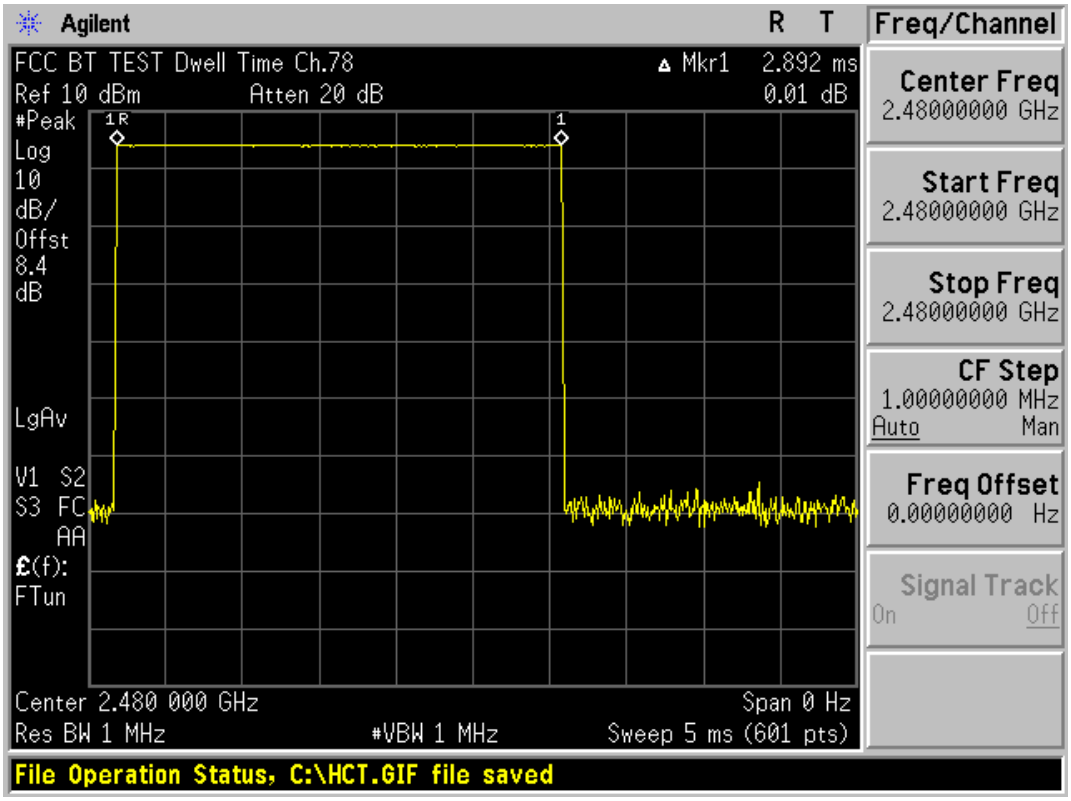
Test Plots (GFSK)
Dwell Time (Low-CH)



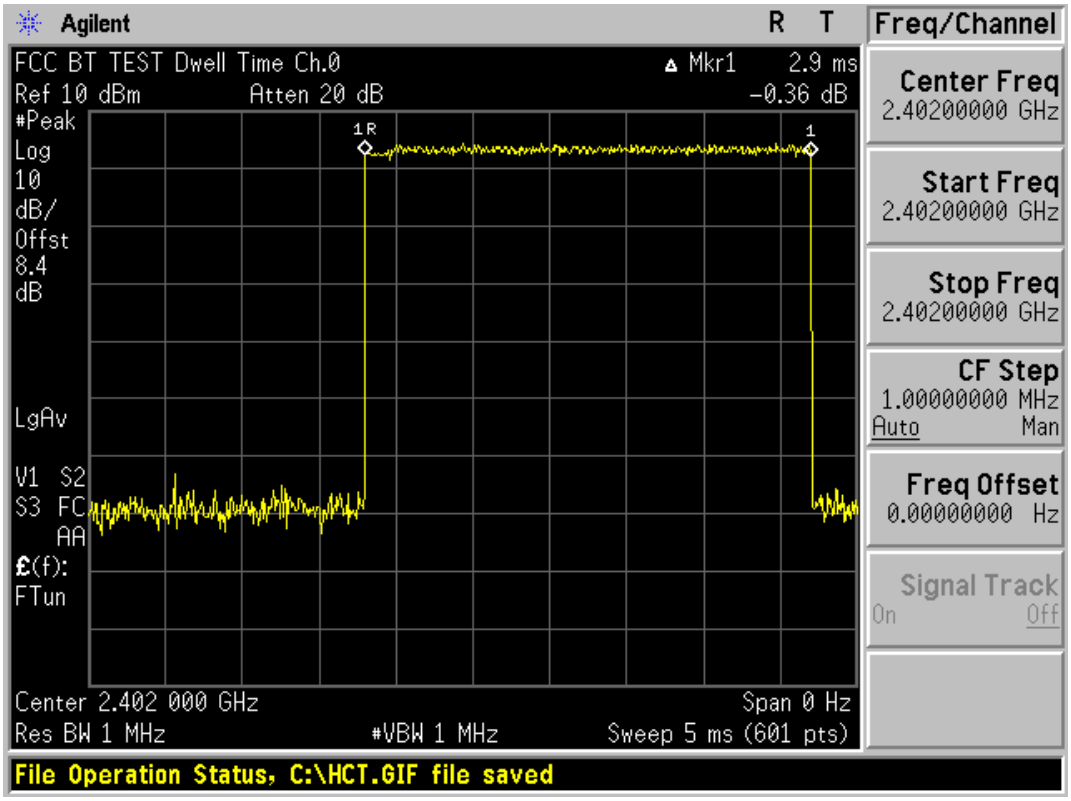

Test Plots (GFSK)
Dwell Time (Mid-CH)



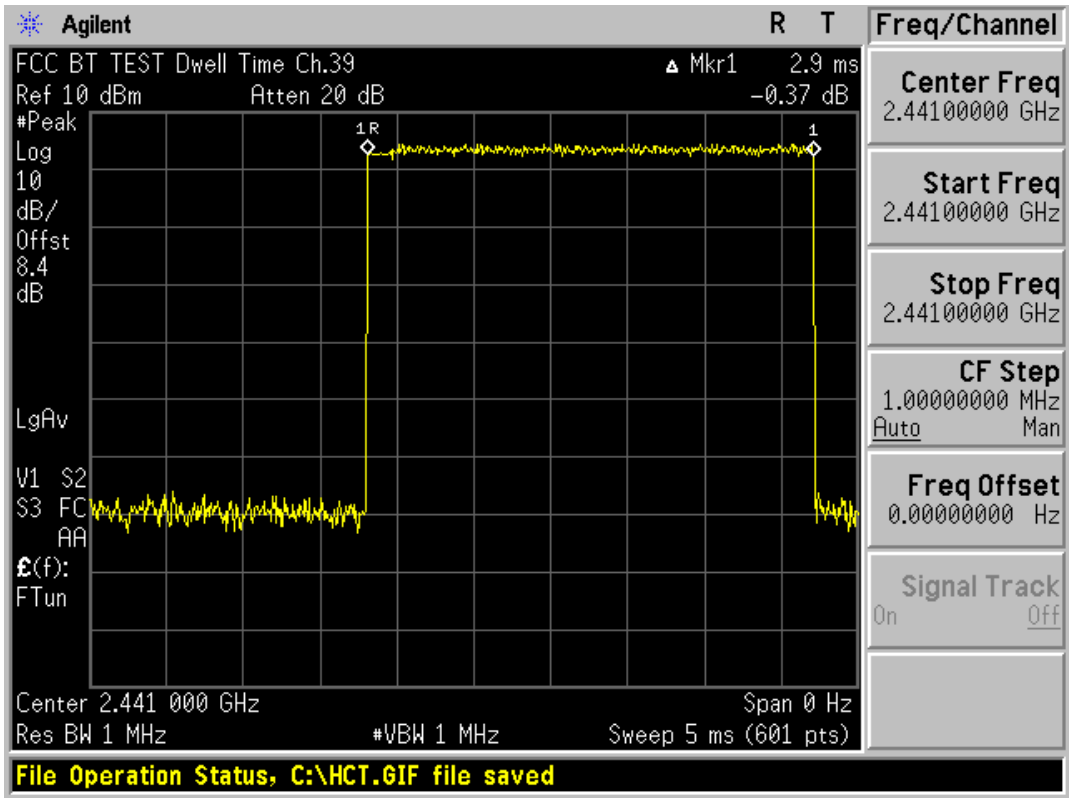
Test Plots (GFSK)
Dwell Time (High-CH)



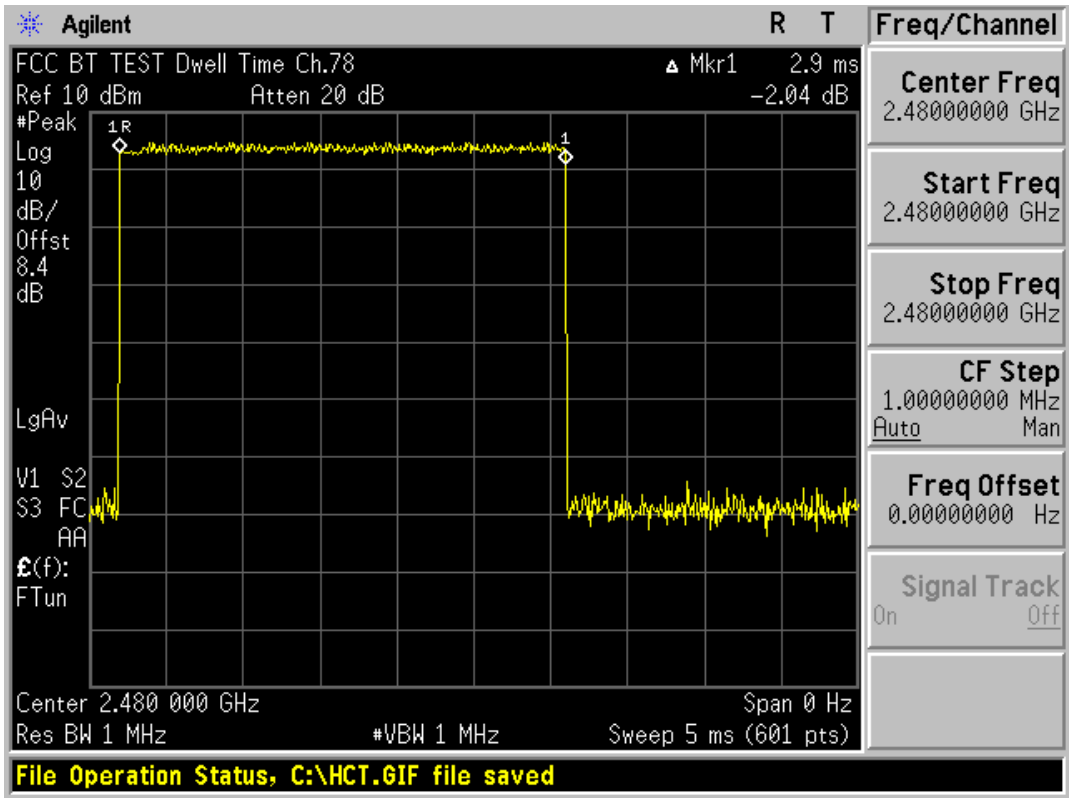

Test Plots (8DPSK)
Dwell Time (Low-CH)



Test Plots (8DPSK)
Dwell Time (Mid-CH)




Test Plots (8DPSK)
Dwell Time (High-CH)



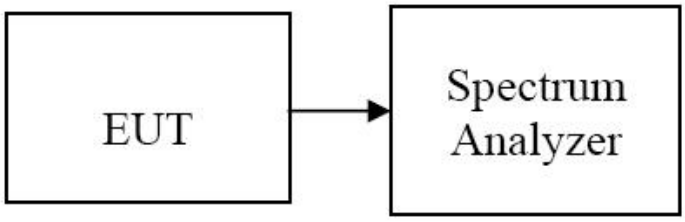
## 7.6 SPURIOUS EMISSIONS

### 7.6.1 CONDUCTED SPURIOUS MEASUREMENT

**LIMIT : §15.247(d)**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

**Test Configuration**




**TEST PROCEDURE**

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

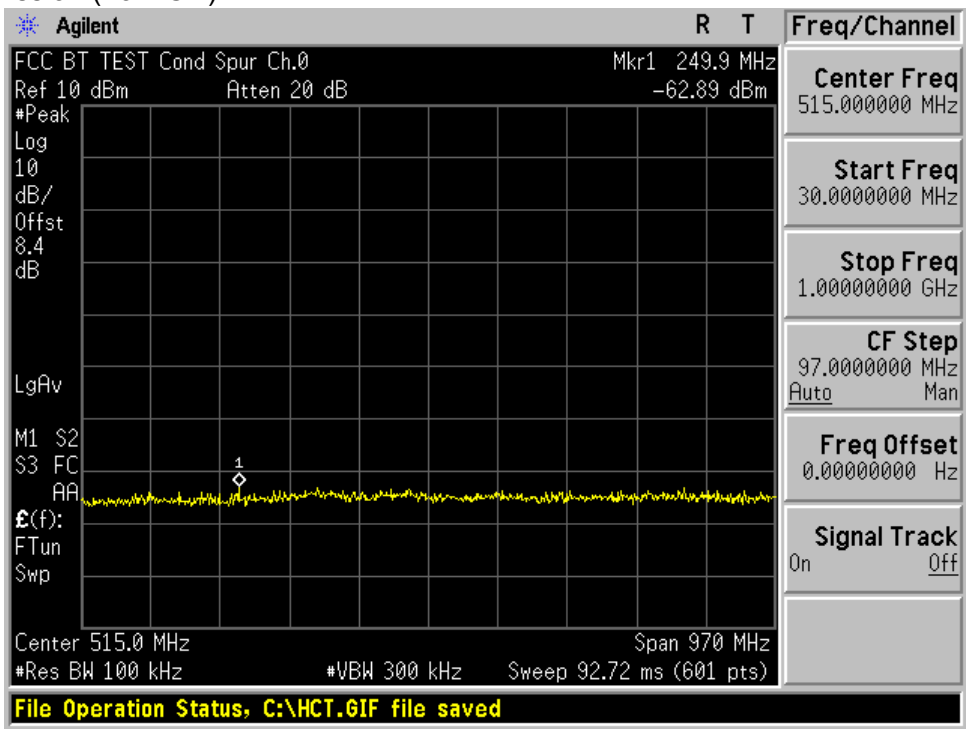
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.
Detector Mode is set to a peak detector Mode.

Measurements are made over the 30 MHz to 26 GHz range with the transmitter set to the lowest, middle, and highest channels.

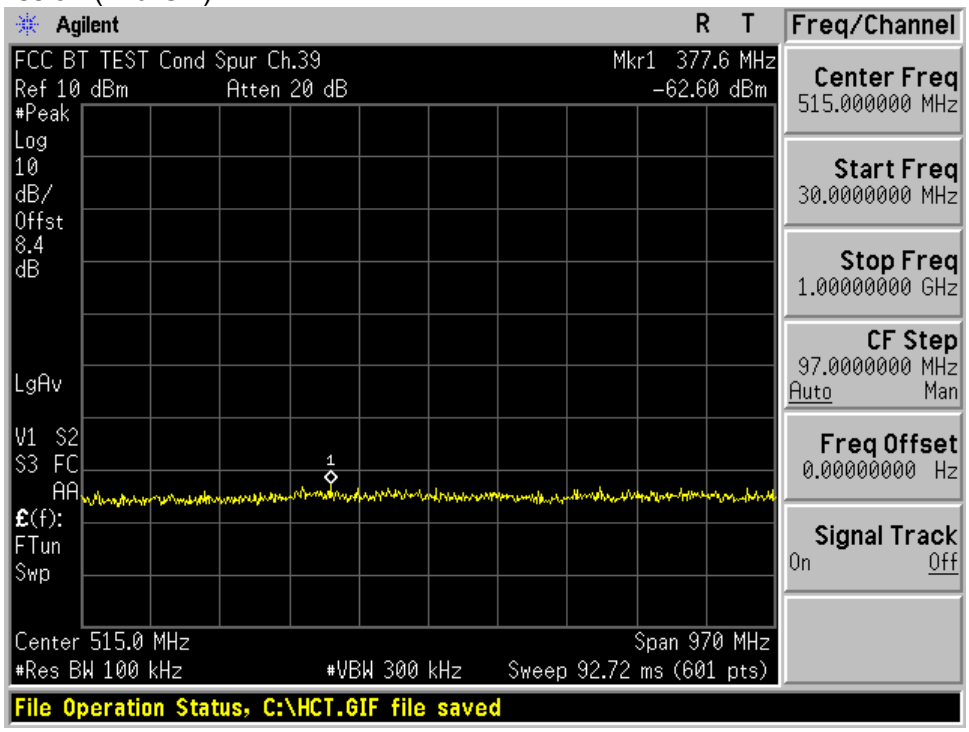
**TEST RESULTS**

No non-compliance noted

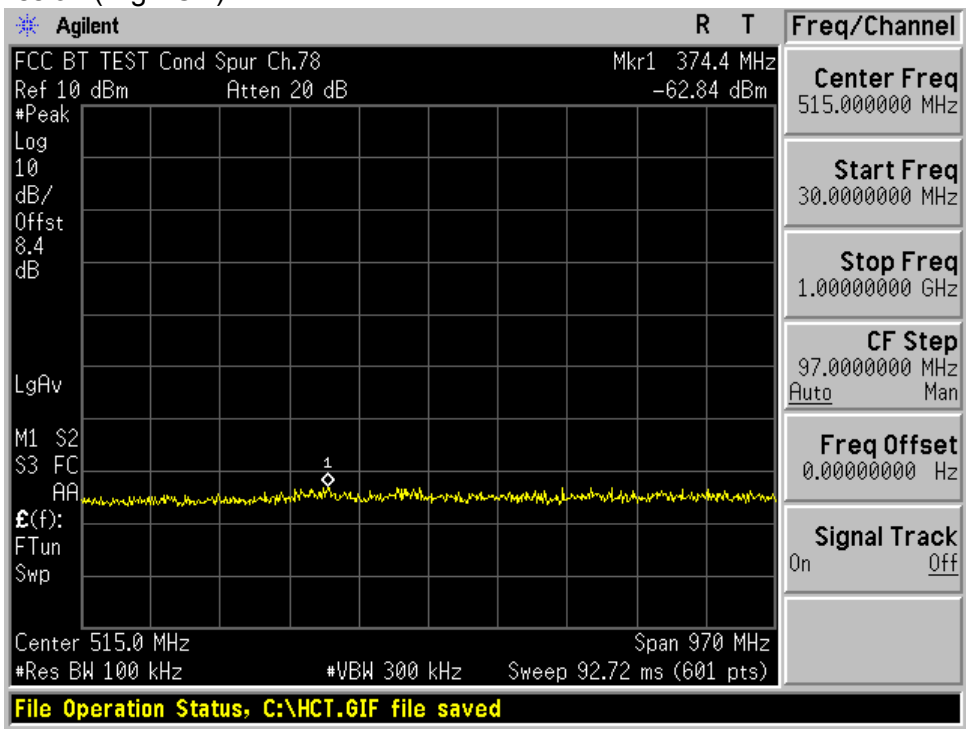
Test Plots (GFSK) - 30 MHz - 1 GHz (RBW:100 kHz, VBW: 300 kHz)
Spurious Emission (Low-CH)



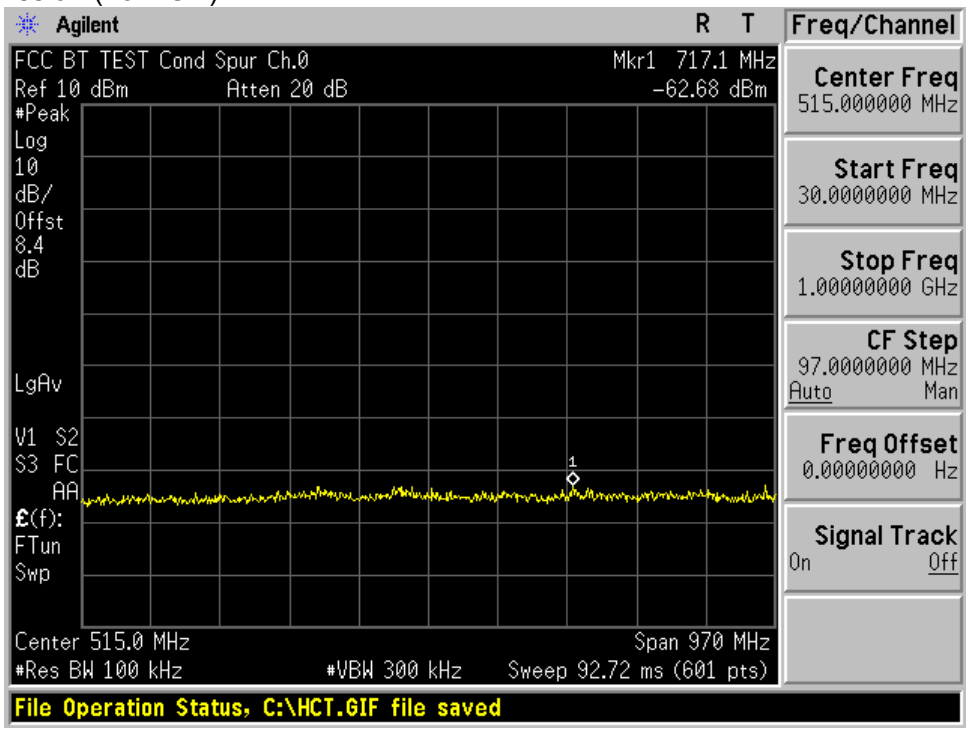

Test Plots (GFSK) - 30 MHz - 1 GHz (RBW:100 kHz, VBW: 300 kHz)
Spurious Emission (Mid-CH)



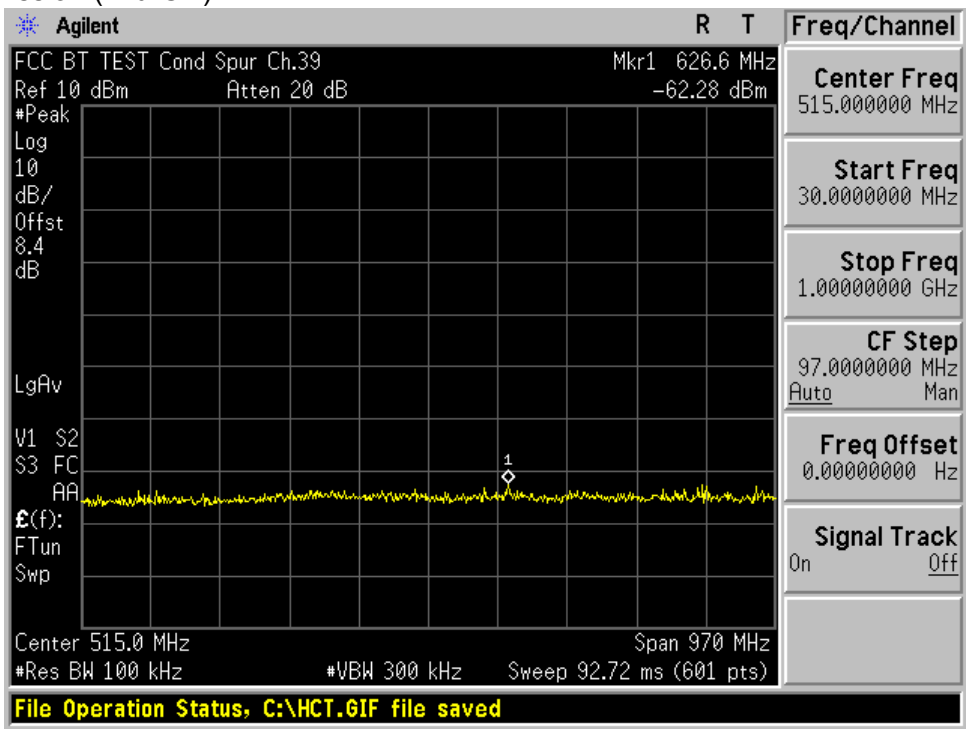
Test Plots (GFSK) - 30 MHz - 1 GHz (RBW:100 kHz, VBW: 300 kHz)
Spurious Emission (High-CH)



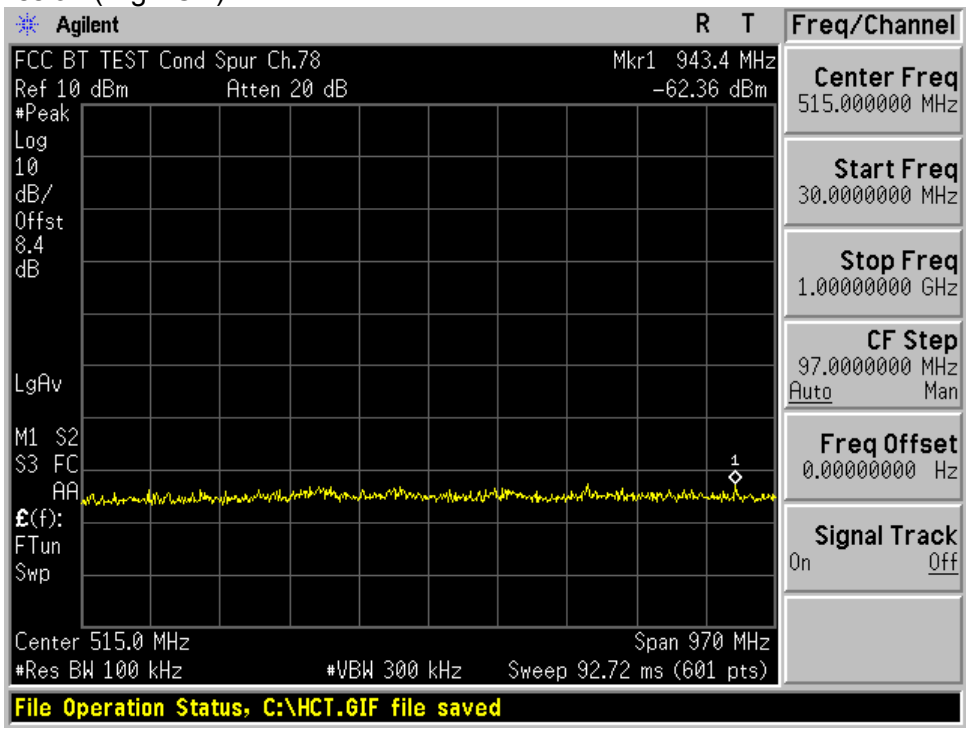

Test Plots (8DPSK) - 30 MHz - 1 GHz (RBW:100 kHz, VBW: 300 kHz)
Spurious Emission (Low-CH)



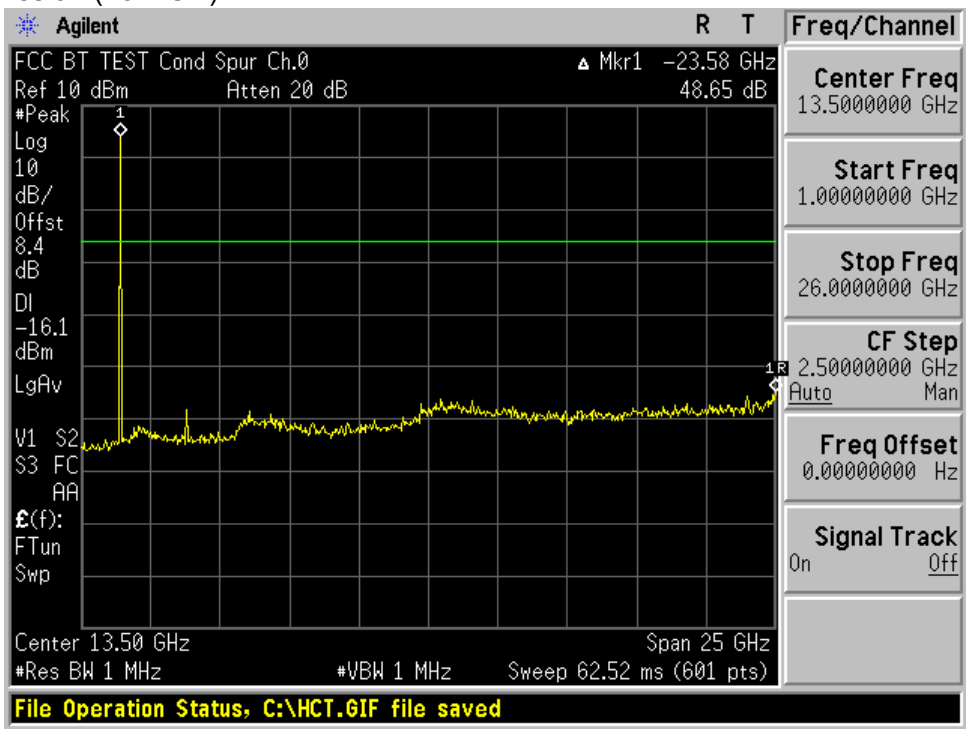
Test Plots (8DPSK) - 30 MHz - 1 GHz (RBW:100 kHz, VBW: 300 kHz)
Spurious Emission (Mid-CH)



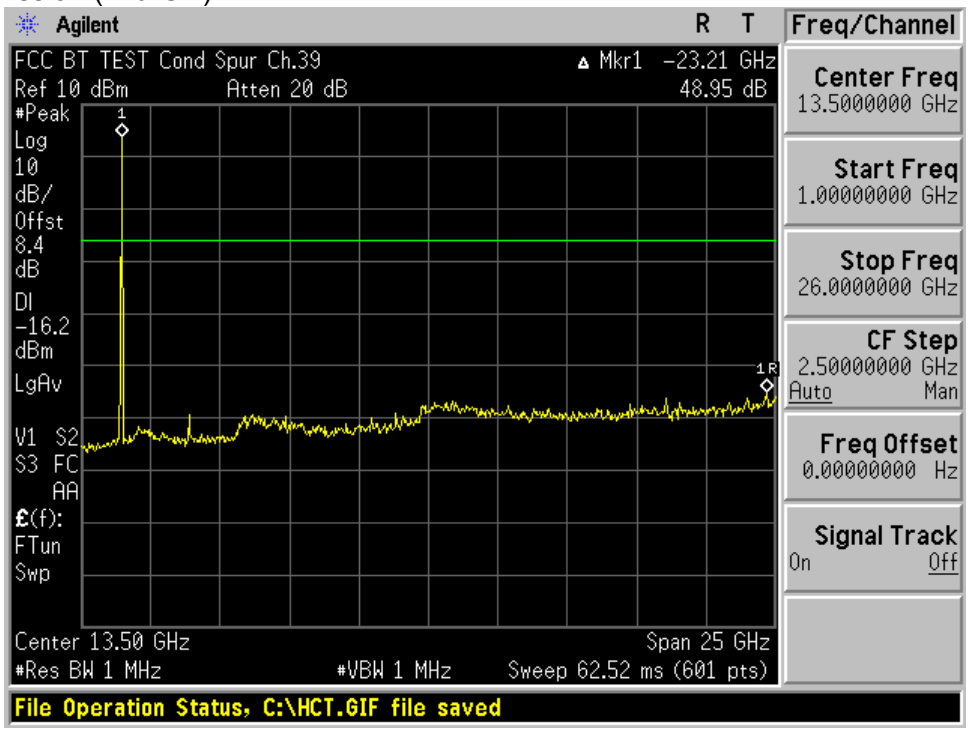

Test Plots (8DPSK) - 30 MHz - 1 GHz (RBW:100 kHz, VBW: 300 kHz)
Spurious Emission (High-CH)



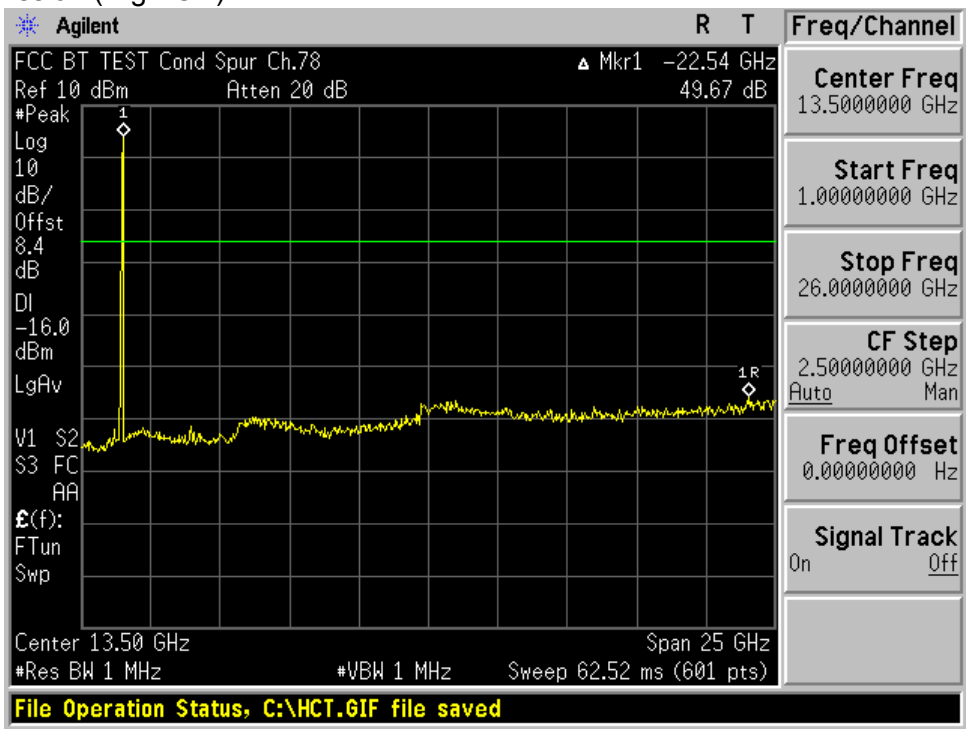
Test Plots (GFSK) - 1 GHz - 26 GHz (RBW:1 MHz, VBW: 1 MHz)
Spurious Emission (Low-CH)



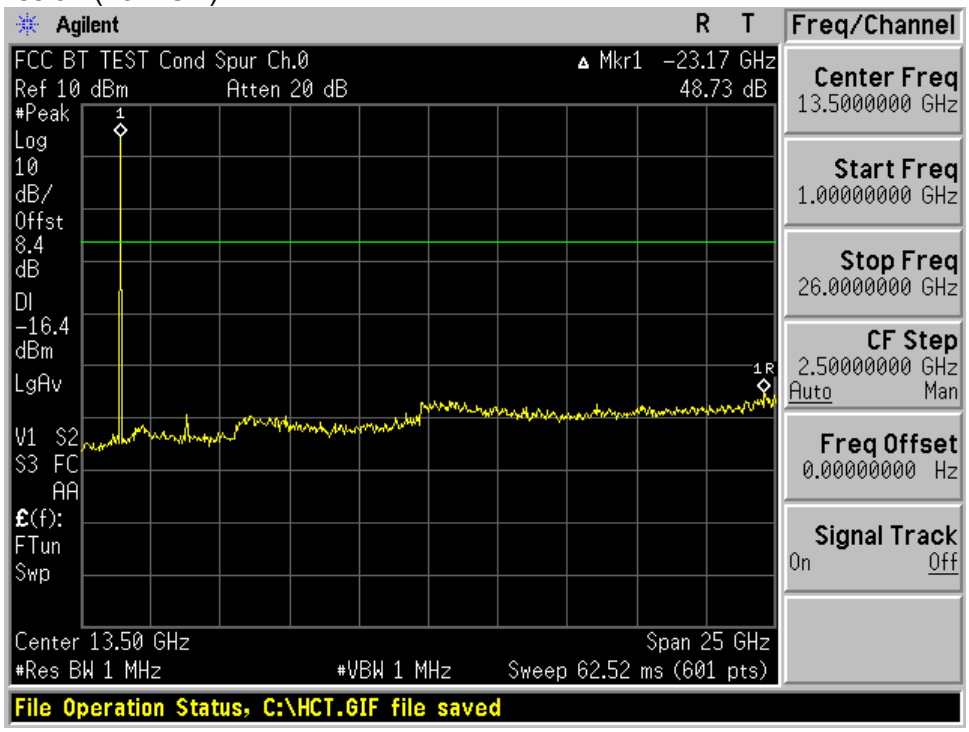

Test Plots (GFSK) - 1 GHz - 26 GHz (RBW:1 MHz, VBW: 1 MHz)
Spurious Emission (Mid-CH)



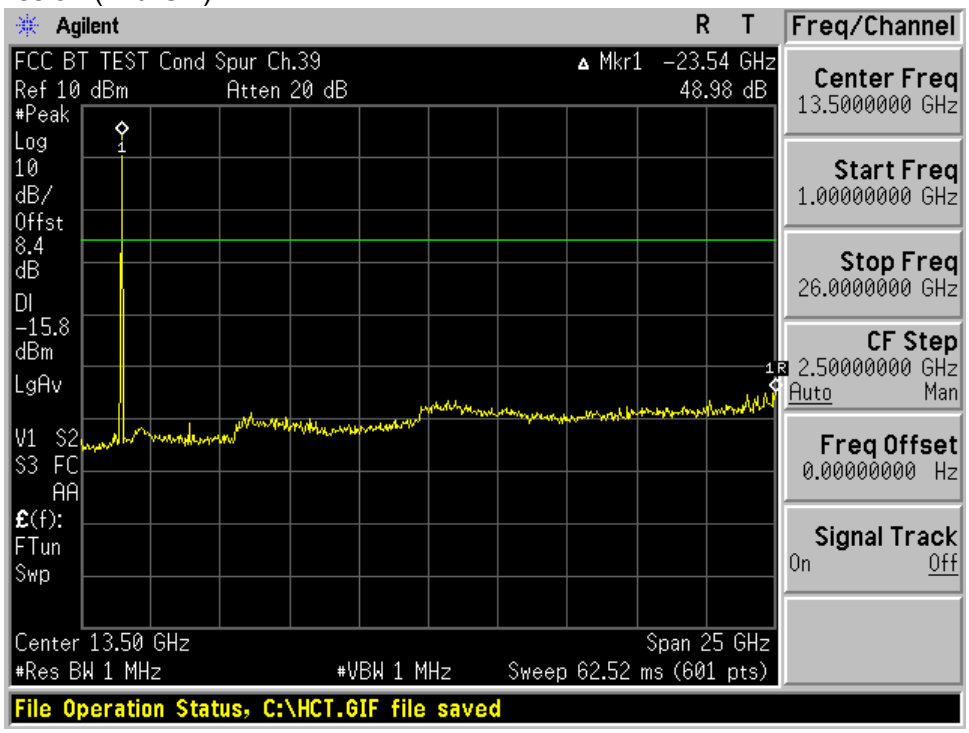
Test Plots (GFSK) - 1 GHz - 26 GHz (RBW:1 MHz, VBW: 1 MHz)
Spurious Emission (High-CH)



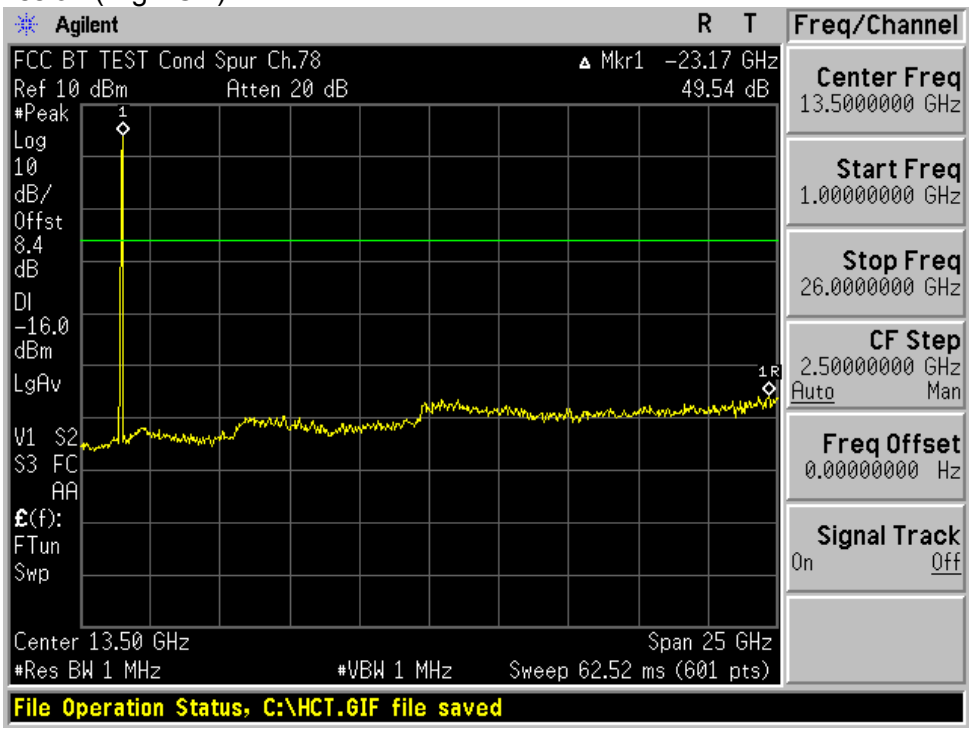

Test Plots (8DPSK) - 1 GHz - 26 GHz (RBW:1 MHz, VBW: 1 MHz)
Spurious Emission (Low-CH)



Test Plots (8DPSK) - 1 GHz - 26 GHz (RBW:1 MHz, VBW: 1 MHz)
Spurious Emission (Mid-CH)




Test Plots (8DPSK) - 1 GHz - 26 GHz (RBW:1 MHz, VBW: 1 MHz)
Spurious Emission (High-CH)



### 7.6.2 RADIATED SPURIOUS EMISSIONS

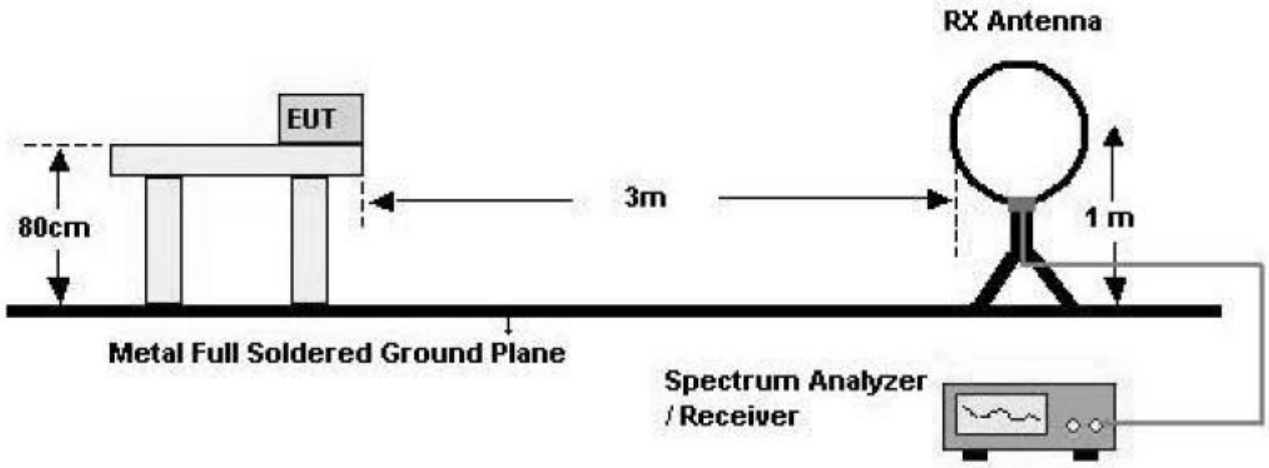
**LIMIT : §15.247(d), §15.205, §15.209**

1. 20dBc in any 100kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

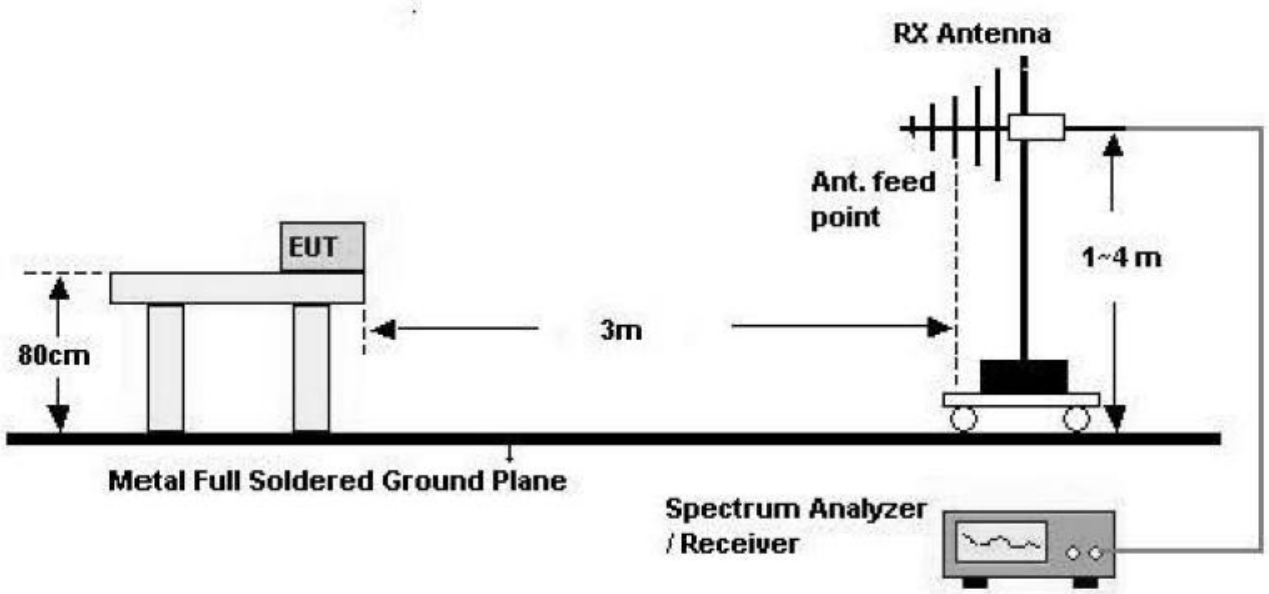
| Frequency (MHz) | Field Strength (uV/m) | Measurement Distance (m) |
|---|---|---|
| 0.009 – 0.490 | 2400/F(kHz) | 300 |
| 0.490 – 1.705 | 24000/F(kHz) | 30 |
| 1.705 – 30 | 30 | 30 |
| 30-88 | 100 | 3 |
| 88-216 | 150 | 3 |
| 216-960 | 200 | 3 |
| Above 960 | 500 | 3 |

## Test Configuration

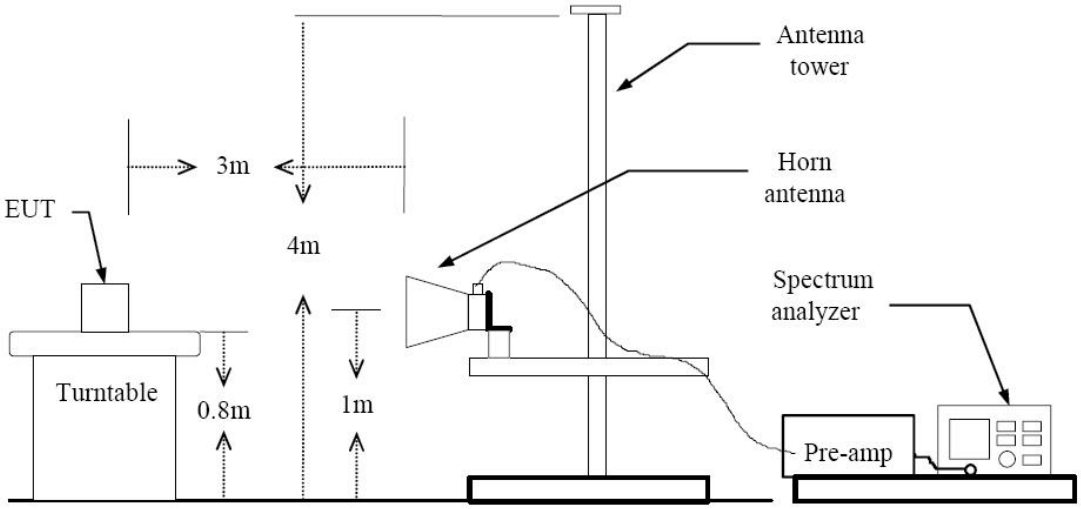
### Below 30 MHz




### 30 MHz - 1 GHz



**Above 1 GHz**




**TEST PROCEDURE**

1. The EUT is placed on a turntable, which is 0.8 m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

**TEST RESULTS**

**9 kHz – 30MHz**

**Operation Mode:** Normal Mode

| Frequency | Reading | Ant. factor | Cable loss | Ant. POL | Total | Limit | Margin |
|---|---|---|---|---|---|---|---|
| ㎒ | dB㎶ | dB /m | dB | (H/V) | dB㎶/m | dB㎶/m | dB |
| No Critical peaks found | | | | | | | |

**Notes:**

1. Measuring frequencies from 9 kHz to the 30MHz.
2. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
3. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
4. Limit line = specific Limits (dBuV) + Distance extrapolation factor

## TEST RESULTS

### Below 1 GHz

**Operation Mode:** Normal Mode (Channel : 2480)

| Frequency MHz | Reading dBuV | Ant. Factor dB/m | Cable Loss dB | ANT POL (H/V) | Total dBuV/m | Limit dBuV/m | Margin dB |
|---|---|---|---|---|---|---|---|
| 61.3 | 15.8 | 11.8 | 1.0 | H | 28.6 | 40.0 | 11.4 |
| 221.2 | 24.2 | 10.3 | 1.8 | V | 36.3 | 46.0 | 9.7 |
| 319.5 | 21.1 | 13.5 | 2.3 | H | 36.9 | 46.0 | 9.1 |
| 360.0 | 24.7 | 14.4 | 2.4 | H | 41.5 | 46.0 | 4.5 |
| 488.0 | 21.4 | 17.4 | 2.9 | H | 41.7 | 46.0 | 4.3 |
| 651.4 | 10.6 | 20.0 | 3.4 | H | 34.0 | 46.0 | 12.0 |

**Notes:**

1. Measuring frequencies from 30 MHz to the 1 GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
3. We have done Normal Mode and EDR Mode test. Worst case of EUT is EDR Mode.

**Above 1 GHz**

**Operation Mode:** CH Low(GFSK)

| Frequency [MHz] | Reading dBuV | ※A.F+CL-AMP GAIN [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Detect |
|---|---|---|---|---|---|---|---|
| 4804 | 57.84 | 1.06 | V | 58.90 | 74 | 15.10 | PK |
| 4804 | 49.55 | 1.06 | V | 50.61 | 54 | 3.39 | AV |
| 7206 | 47.18 | 10.37 | V | 57.55 | 74 | 16.45 | PK |
| 7206 | 33.40 | 10.37 | V | 43.77 | 54 | 10.23 | AV |
| 4804 | 60.83 | 1.06 | H | 61.89 | 74 | 12.11 | PK |
| 4804 | 51.71 | 1.06 | H | 52.77 | 54 | 1.23 | AV |
| 7206 | 47.41 | 10.37 | H | 57.78 | 74 | 16.22 | PK |
| 7206 | 33.42 | 10.37 | H | 43.79 | 54 | 10.21 | AV |

※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS
AMP GAIN: AMPLIFIER GAIN

**Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
   a. Peak Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 MHz.
   b. AV Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 10 Hz.
5. We have done Normal Mode and EDR Mode test. Worst case of EUT is Normal Mode.

**Operation Mode:** CH Mid(GFSK)

| Frequency [MHz] | Reading dBuV | ※A.F+CL-AMP GAIN. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Detect |
|---|---|---|---|---|---|---|---|
| 4882 | 55.72 | 1.82 | V | 57.54 | 74 | 16.46 | PK |
| 4882 | 47.45 | 1.82 | V | 49.27 | 54 | 4.73 | AV |
| 7323 | 47.50 | 10.54 | V | 58.04 | 74 | 15.96 | PK |
| 7323 | 33.70 | 10.54 | V | 44.24 | 54 | 9.76 | AV |
| 4882 | 59.18 | 1.82 | H | 61.00 | 74 | 13.00 | PK |
| 4882 | 51.05 | 1.82 | H | 52.87 | 54 | 1.13 | AV |
| 7323 | 47.38 | 10.54 | H | 57.92 | 74 | 16.08 | PK |
| 7323 | 33.69 | 10.54 | H | 44.23 | 54 | 9.77 | AV |

C·L: CABLE LOSS

AMP GAIN: AMPLIFIER GAIN

**Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
   a. Peak Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 MHz.
   b. AV Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 10 Hz.
5. We have done Normal Mode and EDR Mode test. Worst case of EUT is Normal Mode.

**Operation Mode:** CH High(GFSK)

| Frequency [MHz] | Reading dBuV | ※A.F+CL-AMP GAIN [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Detect |
|---|---|---|---|---|---|---|---|
| 4960 | 57.71 | 1.64 | V | 59.35 | 74 | 14.65 | PK |
| 4960 | 49.59 | 1.64 | V | 51.23 | 54 | 2.77 | AV |
| 7440 | 47.28 | 11.46 | V | 58.74 | 74 | 15.26 | PK |
| 7440 | 33.52 | 11.46 | V | 44.98 | 54 | 9.02 | AV |
| 4960 | 57.67 | 1.64 | H | 59.31 | 74 | 14.69 | PK |
| 4960 | 49.51 | 1.64 | H | 51.15 | 54 | 2.85 | AV |
| 7440 | 47.23 | 11.46 | H | 58.69 | 74 | 15.31 | PK |
| 7440 | 33.64 | 11.46 | H | 45.10 | 54 | 8.90 | AV |

※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS
AMP GAIN: AMPLIFIER GAIN

**Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
   a. Peak Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 MHz.
   b. AV Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 10 Hz.
5. We have done Normal Mode and EDR Mode test. Worst case of EUT is Normal Mode.

### 7.6.3 RADIATED RESTRICTED BAND EDGE MEASUREMENTS

**Test Requirements and limit, §15.247(d), §15.205, §15.209**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a) (See section 15.205(c).

| | |
|---|---|
| Operation Mode | GFSK(Normal) |
| Operating Frequency | 2402 MHz, 2480 MHz |
| Channel No | CH 0, CH 78 |

| Frequency [MHz] | Reading dBuV | ※ A.F.+CL [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Detect |
|---|---|---|---|---|---|---|---|
| 2390.00 | 18.54 | 37.52 | H | 56.06 | 74 | 17.94 | PK |
| 2390.00 | 5.36 | 37.52 | H | 42.88 | 54 | 11.12 | AV |
| 2390.00 | 18.06 | 37.52 | V | 55.58 | 74 | 18.42 | PK |
| 2390.00 | 5.35 | 37.52 | V | 42.87 | 54 | 11.13 | AV |
| 2483.50 | 19.15 | 39.69 | H | 58.84 | 74 | 15.16 | PK |
| 2483.50 | 11.27 | 39.69 | H | 50.96 | 54 | 3.04 | AV |
| 2483.50 | 18.00 | 39.69 | V | 57.69 | 74 | 16.31 | PK |
| 2483.50 | 9.40 | 39.69 | V | 49.09 | 54 | 4.91 | AV |

※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS

**Notes:**

1. Spectrum setting:
   a. Peak Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 MHz.
   b. AV Setting 1 GHz – 26 GHz, RBW=1 MHz, VBW= 10 Hz.
2. We have done Normal Mode and EDR Mode test. Worst case of EUT is Normal Mode.

## 7.7 POWERLINE CONDUCTED EMISSIONS

### LIMIT

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolt (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

| Frequency Range (MHz) | Limits (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56 | 56 to 46 |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

### Test Configuration

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

### TEST PROCEDURE

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.

## ▣ RESULT PLOTS

### Conducted Emissions (Line 1)

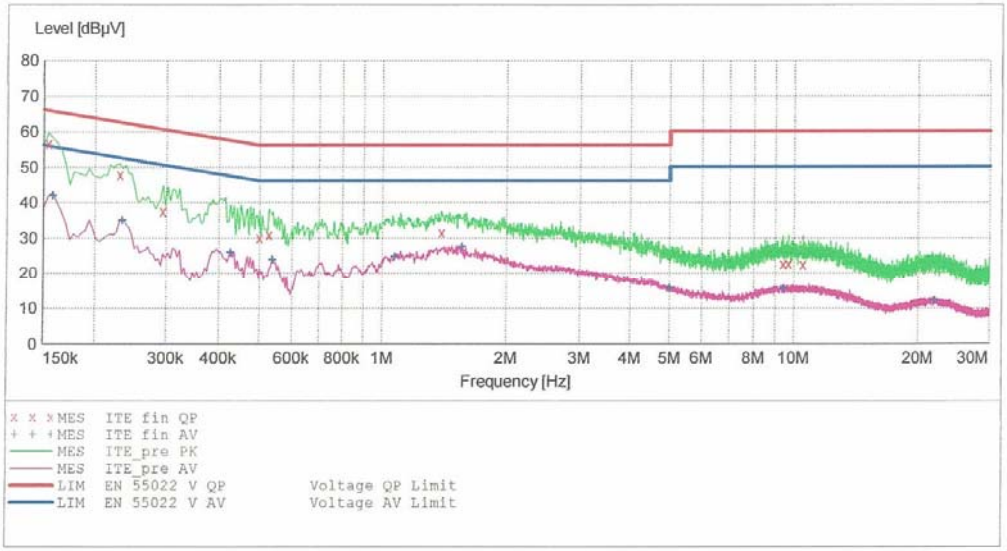
*HCT*

*EMC*

```
EUT:                    P5000
Manufacturer:           PANTECH
Operating Condition:    BT MODE
Test Site:              SHIELD ROOM
Operator:               JS LEE
Test Specification:     CISPR22 CLASS B
Comment:                N
```

***SCAN TABLE: "CISPR22 CLASS B"***

```
  Short Description:                CISPR 22 CLASS B
  Start       Stop        Step        Detector   Meas.     IF       Transducer
  Frequency   Frequency   Width                  Time      Bandw.
  150.0 kHz   500.0 kHz   4.0 kHz     MaxPeak    10.0 ms   9 kHz    None
                                      Average
  500.0 kHz   5.0 MHz     4.0 kHz     MaxPeak    10.0 ms   9 kHz    None
                                      Average
  5.0 MHz     30.0 MHz    4.0 kHz     MaxPeak    10.0 ms   9 kHz    None
                                      Average
```




***MEASUREMENT RESULT: "ITE_fin QP"***

3/29/2011 9:09PM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Line | PE |
|---|---|---|---|---|---|---|
| 0.154010 | 56.40 | 10.3 | 66 | 9.4 | --- | --- |
| 0.230010 | 47.70 | 10.3 | 62 | 14.8 | --- | --- |
| 0.294010 | 37.40 | 10.3 | 60 | 23.1 | --- | --- |
| 0.500000 | 29.90 | 10.3 | 56 | 26.1 | --- | --- |
| 0.528000 | 30.90 | 10.3 | 56 | 25.1 | --- | --- |
| 1.396000 | 31.50 | 10.4 | 56 | 24.5 | --- | --- |
| 9.436000 | 22.50 | 11.0 | 60 | 37.5 | --- | --- |
| 9.704000 | 22.60 | 11.0 | 60 | 37.4 | --- | --- |
| 10.504000 | 22.40 | 11.1 | 60 | 37.6 | --- | --- |

***MEASUREMENT RESULT: "ITE_fin AV"***

3/29/2011 9:09PM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Line | PE |
|---|---|---|---|---|---|---|
| 0.158010 | 41.70 | 10.3 | 56 | 13.9 | --- | --- |
| 0.234010 | 34.70 | 10.3 | 52 | 17.6 | --- | --- |
| 0.426010 | 25.80 | 10.3 | 47 | 21.5 | --- | --- |
| 0.540000 | 23.70 | 10.3 | 46 | 22.3 | --- | --- |
| 1.076000 | 24.60 | 10.4 | 46 | 21.4 | --- | --- |
| 1.568000 | 27.30 | 10.4 | 46 | 18.7 | --- | --- |
| 5.000000 | 15.50 | 10.7 | 46 | 30.5 | --- | --- |
| 9.456000 | 15.20 | 11.0 | 50 | 34.8 | --- | --- |
| 22.000000 | 11.90 | 11.7 | 50 | 38.1 | --- | --- |

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## Conducted Emissions (Line 2)

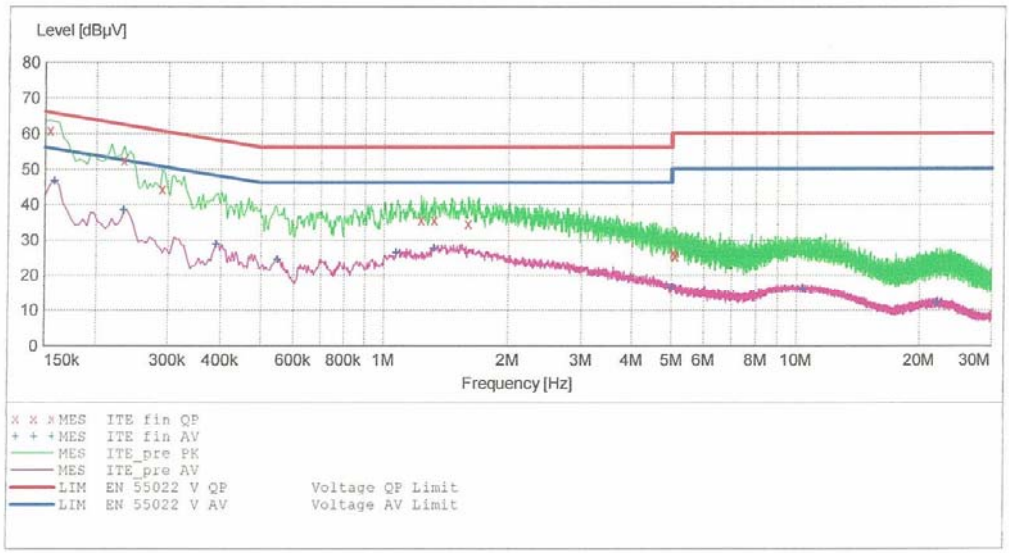
*HCT*

*EMC*

```
EUT:                    P5000
Manufacturer:           PANTECH
Operating Condition:    BT MODE
Test Site:              SHIELD ROOM
Operator:               JS LEE
Test Specification:     CISPR22 CLASS B
Comment:                H
```

***SCAN TABLE: "CISPR22 CLASS B"***

| Short Description: | | | CISPR 22 CLASS B | | | |
|---|---|---|---|---|---|---|
| Start Frequency | Stop Frequency | Step Width | Detector | Meas. Time | IF Bandw. | Transducer |
| 150.0 kHz | 500.0 kHz | 4.0 kHz | MaxPeak<br>Average | 10.0 ms | 9 kHz | None |
| 500.0 kHz | 5.0 MHz | 4.0 kHz | MaxPeak<br>Average | 10.0 ms | 9 kHz | None |
| 5.0 MHz | 30.0 MHz | 4.0 kHz | MaxPeak<br>Average | 10.0 ms | 9 kHz | None |




***MEASUREMENT RESULT: "ITE_fin QP"***

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| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Line | PE |
|---|---|---|---|---|---|---|
| 0.154010 | 60.70 | 10.3 | 66 | 5.1 | --- | --- |
| 0.234010 | 52.40 | 10.3 | 62 | 9.9 | --- | --- |
| 0.290010 | 44.20 | 10.3 | 61 | 16.3 | --- | --- |
| 1.236000 | 35.60 | 10.4 | 56 | 20.4 | --- | --- |
| 1.328000 | 35.50 | 10.4 | 56 | 20.5 | --- | --- |
| 1.604000 | 34.40 | 10.4 | 56 | 21.6 | --- | --- |
| 5.040000 | 26.30 | 10.7 | 60 | 33.7 | --- | --- |
| 5.104000 | 25.60 | 10.7 | 60 | 34.4 | --- | --- |
| 5.120000 | 25.30 | 10.7 | 60 | 34.7 | --- | --- |

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***MEASUREMENT RESULT: "ITE_fin AV"***

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| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Line | PE |
|---|---|---|---|---|---|---|
| 0.158010 | 46.40 | 10.3 | 56 | 9.2 | --- | --- |
| 0.234010 | 38.30 | 10.3 | 52 | 14.0 | --- | --- |
| 0.390010 | 28.70 | 10.3 | 48 | 19.3 | --- | --- |
| 0.548000 | 24.30 | 10.3 | 46 | 21.7 | --- | --- |
| 1.076000 | 26.30 | 10.4 | 46 | 19.7 | --- | --- |
| 1.328000 | 27.50 | 10.4 | 46 | 18.5 | --- | --- |
| 5.000000 | 16.50 | 10.7 | 46 | 29.5 | --- | --- |
| 10.376000 | 15.90 | 11.1 | 50 | 34.1 | --- | --- |
| 22.128000 | 11.90 | 11.8 | 50 | 38.1 | --- | --- |

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# 8. LIST OF TEST EQUIPMENT

| Manufacturer | Model / Equipment | Calibration Interval | Calibration Due | Serial No. |
|---|---|---|---|---|
| Rohde & Schwarz | ESH2-Z5/ LISN | Annual | 02/01/2012 | 861741/013 |
| Schwarzbeck | VULB 9160/ TRILOG Antenna | Biennial | 07/15/2012 | 9160-3150 |
| HD | MA240/ Antenna Position Tower | N/A | N/A | 556 |
| EMCO | 1050/ Turn Table | N/A | N/A | 114 |
| HD GmbH | HD 100/ Controller | N/A | N/A | 13 |
| HD GmbH | KMS 560/ SlideBar | N/A | N/A | 12 |
| Rohde & Schwarz | ESH3-Z2/ PULSE LIMITER | Annual | 10/25/2011 | 375.8810.352 |
| Rohde & Schwarz | SCU-18/ Signal Conditioning Unit | Annual | 09/29/2011 | 10094 |
| Schwarzbeck | BBHA 9120D/ Horn Antenna | Biennial | 09/23/2011 | 296 |
| Rohde & Schwarz | FSP30 / Spectrum Analyzer | Annual | 03/23/2012 | 839117/011 |
| Agilent | E4440A / Spectrum Analyzer | Annual | 06/09/2011 | US45303008 |
| Agilent | E4416A /Power Meter | Annual | 01/04/2012 | GB41291412 |
| Agilent | E9327A /POWER SENSOR | Annual | 07/23/2011 | MY4442009 |
| Wainwright Instrument | WHF3.3/18G-10EF / High Pass Filter | Annual | 06/25/2011 | 1 |
| Wainwright Instrument | WRCJ2400/2483.5-2370/2520-60/14SS / Band Reject Filter | Annual | 07/23/2011 | 1 |
| Hewlett Packard | 11636B/Power Divider | Annual | 12/29/2011 | 11377 |
| Hewlett Packard | 11667B / Power Spliter | Annual | 11/08/2011 | 10126 |
| DIGITAL | EP-3010 /DC POWER SUPPLY | Annual | 01/04/2012 | 3110117 |
| ITECH | IT6720 / DC POWER SUPPLY | Annual | 12/01/2011 | 010002156287001199 |
| TESCOM | TC-3000A / BLUETOOTH TESTER | Annual | 01/10/2012 | 3000A490112 |
| Rohde & Schwarz | CBT / BLUETOOTH TESTER | Annual | 06/24/2011 | 100422 |
| EMCO | 6502.LOOP ANTENNA | Biennial | 01/13/2012 | 9009-2536 |