



**FCC 47 CFR PART 15 SUBPART C**

**TEST REPORT**

**For**

**Handy Wireless CCD Barcode Scanner**

**Model: BW-130BT / Z-3130BT**

**Trade Name: AIMEX**

*Issued to*

**AIMEX Corporation  
2-4-14 Higashiyaguchi, Ohta-ku, Tokyo  
146 JAPAN**

*Issued by*

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[service@ccsrf.com](mailto:service@ccsrf.com)**





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## 1. TEST RESULT CERTIFICATION

**Applicant:** AIMEX Corporation  
2-4-14 Higashiyaguchi, Ohta-ku, Tokyo 146 JAPAN

**Equipment Under Test:** Handy Wireless CCD Barcode Scanner

**Trade Name:** AIMEX

**Model :** BW-130BT / Z-3130BT

**Date of Test:** October 2 ~ November 17, 2009

| APPLICABLE STANDARDS         |                         |
|------------------------------|-------------------------|
| STANDARD                     | TEST RESULT             |
| FCC 47 CFR Part 15 Subpart C | No non-compliance noted |

### We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in **ANSI C63.4: 2003** and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247.

The test results of this report relate only to the tested sample EUT identified in this report.

*Approved by:*

*Reviewed by:*

Rex Lai  
Section Manager  
Compliance Certification Services Inc.

Gina Lo  
Section Manager  
Compliance Certification Services Inc.



## 2. EUT DESCRIPTION

|                              |  |
|------------------------------|--|
| <b>Product</b>               | Handy Wireless CCD Barcode Scanner   |
| <b>Trade Name</b>            | AIMEX  |
| <b>Model Number</b>          | BW-130BT / Z-3130BT  |
| <b>Model Discrepancy</b>     | All the specification and layout are identical except they come with different model numbers for marketing purposes. |
| <b>Power Supply</b>          | Powered by AAA batteries × 2 (DC: 3V)  |
| <b>Frequency Range</b>       | 2402 ~ 2480 MHz  |
| <b>Transmit Power</b>        | 0.97dBm  |
| <b>Modulation Technique</b>  | GFSK for 1Mbps; $\pi/4$ -DQPSK for 2Mbps; 8DPSK for 3Mbps  |
| <b>Transmit Data Rate</b>    | 1, 2, 3Mbps  |
| <b>Number of Channels</b>    | 79 Channels  |
| <b>Antenna Specification</b> | Gain: 2 dBi  |
| <b>Antenna Designation</b>   | Chip Antenna   |

**Remark:**

1. The sample selected for test was production product and was provided by manufacturer.
2. This submittal(s) (test report) is intended for FCC ID: **XUC-BW-130BT** filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.



### **3. TEST METHODOLOGY**

The tests documented in this report were performed in accordance with ANSI C63.4 and FCC CFR 47 Part 15.207, 15.209 and 15.247.

#### **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 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 3m away from the receiving antenna, which varied from 1m to 4m 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 maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4.

**3.4FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS**

- (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                        | MHz                 | MHz             | GHz              |
|----------------------------|---------------------|-----------------|------------------|
| 0.090 - 0.110              | 16.42 - 16.423      | 399.9 - 410     | 4.5 - 5.15       |
| <sup>1</sup> 0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614       | 5.35 - 5.46      |
| 2.1735 - 2.1905            | 16.80425 - 16.80475 | 960 - 1240      | 7.25 - 7.75      |
| 4.125 - 4.128              | 25.5 - 25.67        | 1300 - 1427     | 8.025 - 8.5      |
| 4.17725 - 4.17775          | 37.5 - 38.25        | 1435 - 1626.5   | 9.0 - 9.2        |
| 4.20725 - 4.20775          | 73 - 74.6           | 1645.5 - 1646.5 | 9.3 - 9.5        |
| 6.215 - 6.218              | 74.8 - 75.2         | 1660 - 1710     | 10.6 - 12.7      |
| 6.26775 - 6.26825          | 108 - 121.94        | 1718.8 - 1722.2 | 13.25 - 13.4     |
| 6.31175 - 6.31225          | 123 - 138           | 2200 - 2300     | 14.47 - 14.5     |
| 8.291 - 8.294              | 149.9 - 150.05      | 2310 - 2390     | 15.35 - 16.2     |
| 8.362 - 8.366              | 156.52475 -         | 2483.5 - 2500   | 17.7 - 21.4      |
| 8.37625 - 8.38675          | 156.52525           | 2655 - 2900     | 22.01 - 23.12    |
| 8.41425 - 8.41475          | 156.7 - 156.9       | 3260 - 3267     | 23.6 - 24.0      |
| 12.29 - 12.293             | 162.0125 - 167.17   | 3332 - 3339     | 31.2 - 31.8      |
| 12.51975 - 12.52025        | 167.72 - 173.2      | 3345.8 - 3358   | 36.43 - 36.5     |
| 12.57675 - 12.57725        | 240 - 285           | 3600 - 4400     | ( <sup>2</sup> ) |
| 13.36 - 13.41              | 322 - 335.4         |                 |                  |

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

- (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.



### 3.5 DESCRIPTION OF TEST MODES

The EUT (model: BW-130BT) had been tested under operating condition.

Test program used to control the EUT for staying in continuous transmitting mode was programmed.

Software used to control the EUT for staying in continuous transmitting mode was programmed.

The worst case data rate is determined as the data rate with highest output power.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz, which worst case was in normal link mode only.

During the preliminary test, GFSK,  $\pi/4$ -QPSK & 8DPSK with DH1 were pre-tested and found that 8DPSK emits the highest output power. Then the tests were carried on with DH1 compare to DH3 & DH5 and found that 8DPSK with DH5 emit the highest output power, and therefore had been tested under operating condition.

Following channels were selected for the for radiated emission testing only as listed below:

| Tested Channel | Modulation Type | Packet Type | Date Rate |
|----------------|-----------------|-------------|-----------|
| Low, Mid, High | GFSK            | DH 5        | 1         |
| Low, Mid, High | 8DPSK           | DH 5        | 3         |



## 4. INSTRUMENT CALIBRATION

### 4.1 MEASURING 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 equipment, which is traceable to recognized national standards.

### 4.2 MEASUREMENT EQUIPMENT USED

#### Equipment Used for Emissions Measurement

*Remark: Each piece of equipment is scheduled for calibration once a year.*

| Conducted Emissions Test Site |              |        |               |                 |
|-------------------------------|--------------|--------|---------------|-----------------|
| Name of Equipment             | Manufacturer | Model  | Serial Number | Calibration Due |
| Spectrum Analyzer             | Agilent      | E4446A | MY43360131    | 02/23/2010      |
| Power Meter                   | Agilent      | E4416A | GB41291611    | 04/05/2010      |
| Power Sensor                  | Agilent      | E9327A | US40441097    | 06/05/2010      |

| 3M Semi Anechoic Chamber |                 |                   |                                     |                          |
|--------------------------|-----------------|-------------------|-------------------------------------|--------------------------|
| Name of Equipment        | Manufacturer    | Model             | Serial Number                       | Calibration Due          |
| Spectrum Analyzer        | Agilent         | E4446A            | US42510252                          | 09/09/2010               |
| Test Receiver            | Rohde&Schwarz   | ESCI              | 100064                              | 11/28/2010               |
| Switch Controller        | TRC             | Switch Controller | SC94050010                          | 05/02/2010               |
| 4 Port Switch            | TRC             | 4 Port Switch     | SC94050020                          | 05/02/2010               |
| Loop Antenna             | EMCO            | 6502              | 8905/2356                           | 05/28/2010               |
| Horn-Antenna             | TRC             | HA-0502           | 06                                  | 06/03/2010               |
| Horn-Antenna             | TRC             | HA-0801           | 04                                  | 06/18/2010               |
| Horn-Antenna             | TRC             | HA-1201A          | 01                                  | 08/10/2010               |
| Horn-Antenna             | TRC             | HA-1301A          | 01                                  | 08/10/2010               |
| Bilog- Antenna           | Sunol Sciences  | JB3               | A030205                             | 03/27/2010               |
| Loop Antenna             | EMCO            | 6502              | 8905/2356                           | 05/28/2010               |
| Turn Table               | Max-Full        | MFT-120S          | T120S940302                         | N.C.R.                   |
| Antenna Tower            | Max-Full        | MFA-430           | A440940302                          | N.C.R.                   |
| Controller               | Max-Full        | MF-CM886          | CC-C-1F-13                          | N.C.R.                   |
| Site NSA                 | CCS             | N/A               | FCC MRA: TW1039<br>IC: 2324G-1 / -2 | 10/16/2010<br>11/04/2010 |
| Test S/W                 | LABVIEW (V 6.1) |                   |                                     |                          |





### 4.3 MEASUREMENT UNCERTAINTY

| PARAMETER                               | UNCERTAINTY |
|---|-------------|
| 3M Semi Anechoic Chamber / 30MHz ~ 1GHz | +/- 3.70    |
| 3M Semi Anechoic Chamber / Above 1GHz   | +/- 3.09    |

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



## **5. FACILITIES AND ACCREDITATIONS**

### **5.1 FACILITIES**

All measurement facilities used to collect the measurement data are located at

☐ No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.

Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

☒ No.11, Wugong 6th Rd., Wugu Industrial Park, Taipei Hsien 248, Taiwan

Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

☐ No.81-1, Lane 210, Bade 2nd Rd., Luchu Hsiang, Taoyuan Hsien 338, Taiwan

Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

### **5.2 EQUIPMENT**




Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, 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."

**5.3 TABLE OF ACCREDITATIONS AND LISTINGS**

| Country | Agency          | Scope of Accreditation   | Logo  |
|---------|-----------------|--|---|
| USA     | FCC             | 3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements   | <br>FCC MRA: TW1039            |
| Taiwan  | TAF             | LP0002, RTTE01, FCC Method-47 CFR Part 15 Subpart C, D, E, RSS-210, RSS-310<br>IDA TS SRD, AS/NZS 4268, AS/NZS 4771, TS 12.1 & 12.2, ETSI EN 300 440-1, ETSI EN 300 440-2, ETSI EN 300 328, ETSI EN 300 220-1, ETSI EN 300 220-2, ETSI EN 301 893, ETSI EN 301 489-1/3/7/17<br>FCC OET Bulletin 65 + Supplement C, EN 50360, EN 50361, EN 50371, RSS 102, EN 50383, EN 50385, EN 50392, IEC 62209, CNS 14958-1, CNS 14959<br>FCC Method -47 CFR Part 15 Subpart B<br>IEC / EN 61000-3-2, IEC / EN 61000-3-3, IEC / EN 61000-4-2/3/4/5/6/8/11 | <br>Testing Laboratory<br>1309 |
| Canada  | Industry Canada | 3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform  | <br>IC 2324G-1<br>IC 2324G-2   |

*\* No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.*



## 6. SETUP OF EQUIPMENT UNDER TEST

### 6.1 SETUP CONFIGURATION OF EUT

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

### 6.2 SUPPORT EQUIPMENT

| No. | Device Type | Brand | Model | Series No. | FCC ID   | Data Cable | Power Cord  |
|-----|-------------|-------|-------|------------|----------|------------|---|
| 1.  | Notebook PC | DELL  | PP05L | 7T390 A03  | E2K5HCKT | N/A        | AC I/P:<br>Unshielded, 1.8m<br>DC O/P:<br>Unshielded, 1.8m<br>with a core |

**Remark:**

1. *All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
2. *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*



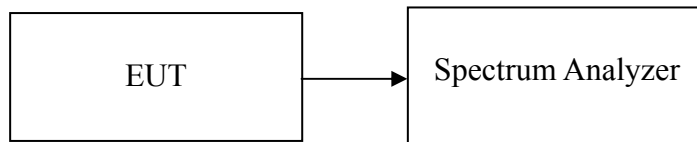
## 7. FCC PART 15.247 REQUIREMENTS

### 7.120 DB BANDWIDTH

#### LIMIT

None; for reporting purposes only.

#### Test Configuration



#### TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=10kHz, VBW = 30 kHz , Span = 1.5MHz, Sweep = auto.
4. Mark the peak frequency and 20dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

#### TEST RESULTS

*No non-compliance noted.*

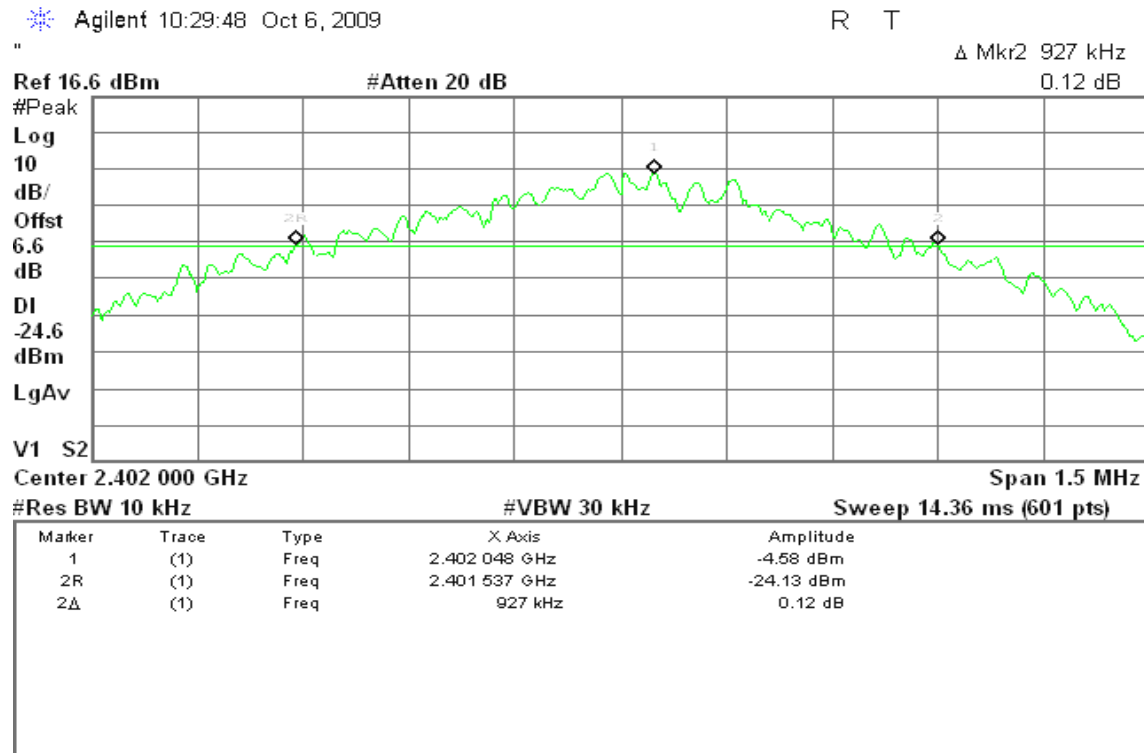
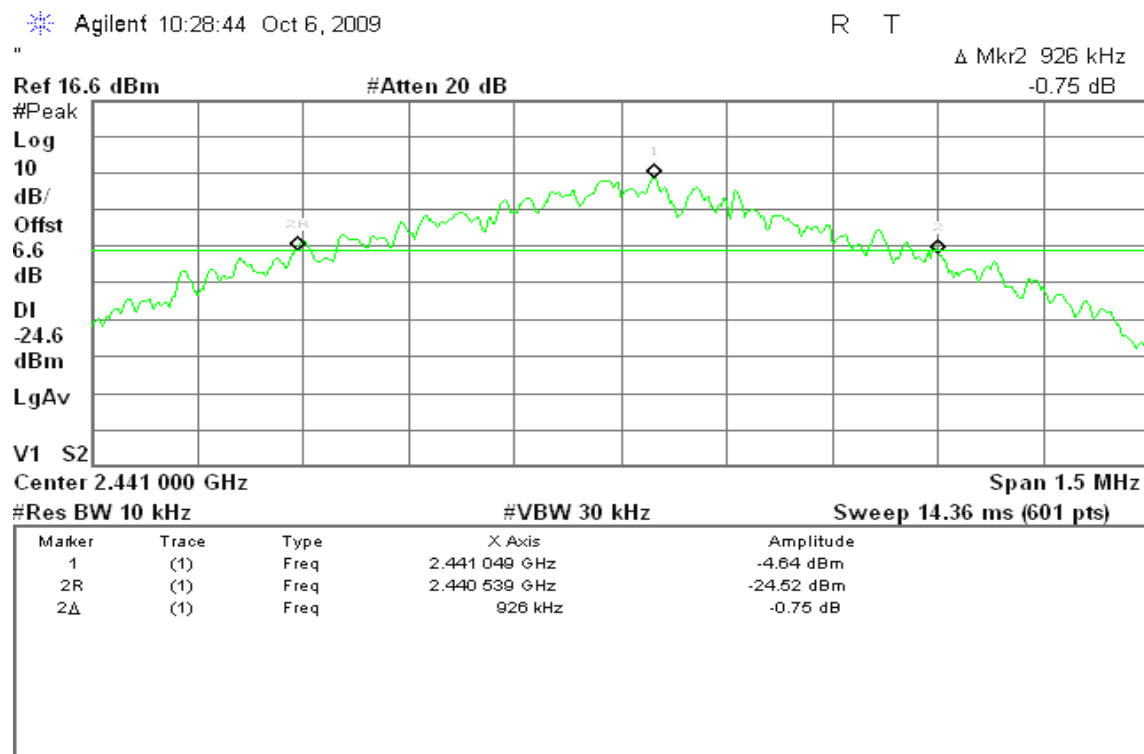
#### Test Data

##### **For GFSK / DH5**

| Channel | Frequency (MHz) | 20dB Bandwidth (MHz) |
|---------|-----------------|----------------------|
| Low     | 2402            | 0.927                |
| Mid     | 2441            | 0.926                |
| High    | 2480            | 0.929                |

##### **For 8DPSK / DH5**

| Channel | Frequency (MHz) | 20dB Bandwidth (MHz) |
|---------|-----------------|----------------------|
| Low     | 2402            | 1.244                |
| Mid     | 2441            | 1.245                |
| High    | 2480            | 1.239                |

**Test Plot****For GFSK / DH5****20dB Bandwidth (CH Low)****20dB Bandwidth (CH Mid)**



## 20dB Bandwidth (CH High)

Agilent 10:27:52 Oct 6, 2009

R T

Δ Mkr2 929 kHz  
0.10 dB

Ref 16.6 dBm

#Atten 20 dB

#Peak

Log

10

dB/

Offst

6.6

dB

DI

-25.6

dBm

LgAv

V1 S2

Center 2.480 000 GHz

Span 1.5 MHz

#Res BW 10 kHz

#VBW 30 kHz

Sweep 14.36 ms (601 pts)

| Marker | Trace | Type | X Axis        | Amplitude  |
|--------|-------|------|---------------|------------|
| 1      | (1)   | Freq | 2.480 003 GHz | -5.62 dBm  |
| 2R     | (1)   | Freq | 2.479 535 GHz | -25.42 dBm |
| 2Δ     | (1)   | Freq | 929 kHz       | 0.10 dB    |



## For 8DPSK / DH5

### 20dB Bandwidth (CH Low)

Agilent 10:24:39 Oct 6, 2009

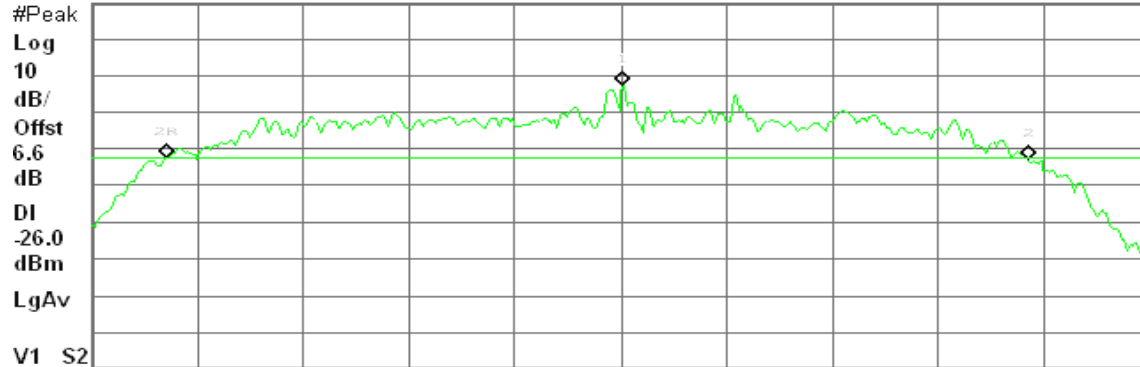
R T

Δ Mkr2 1.244 MHz

Ref 16.6 dBm

#Atten 20 dB

-0.42 dB



Center 2.402 000 GHz

Span 1.5 MHz

#Res BW 10 kHz

#VBW 30 kHz

Sweep 14.36 ms (601 pts)

| Marker | Trace | Type | X Axis        | Amplitude  |
|--------|-------|------|---------------|------------|
| 1      | (1)   | Freq | 2.402 003 GHz | -6.04 dBm  |
| 2R     | (1)   | Freq | 2.401 353 GHz | -25.89 dBm |
| 2Δ     | (1)   | Freq | 1.244 MHz     | -0.42 dB   |

### 20dB Bandwidth (CH Mid)

Agilent 10:25:35 Oct 6, 2009

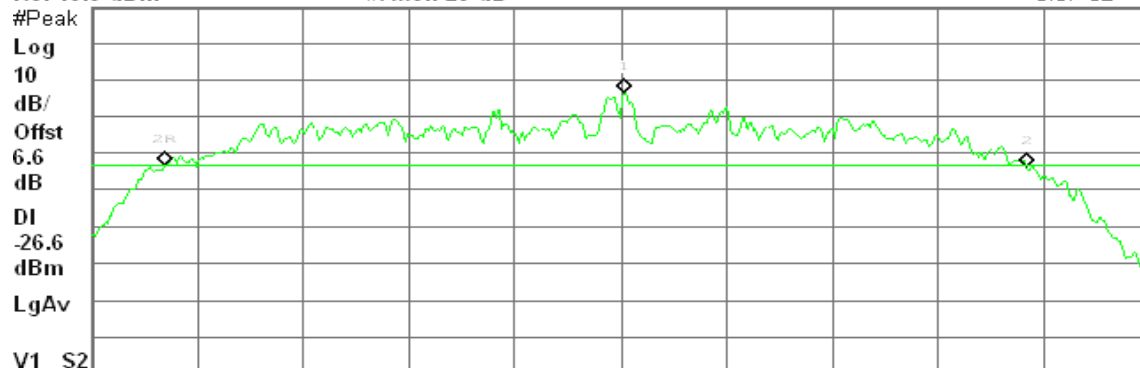
R T

Δ Mkr2 1.245 MHz

Ref 16.6 dBm

#Atten 20 dB

-0.37 dB



Center 2.441 000 GHz

Span 1.5 MHz

#Res BW 10 kHz

#VBW 30 kHz

Sweep 14.36 ms (601 pts)

| Marker | Trace | Type | X Axis        | Amplitude  |
|--------|-------|------|---------------|------------|
| 1      | (1)   | Freq | 2.441 005 GHz | -6.57 dBm  |
| 2R     | (1)   | Freq | 2.440 351 GHz | -26.80 dBm |
| 2Δ     | (1)   | Freq | 1.245 MHz     | -0.37 dB   |





## 20dB Bandwidth (CH High)

Agilent 10:26:34 Oct 6, 2009

R T

Δ Mkr2 1.239 MHz

Ref 16.6 dBm

#Atten 20 dB

-0.07 dB

#Peak

Log

10

dB/

Offst

6.6

dB

DI

-27.5

dBm

LgAv

V1 S2

Start 2.479 250 GHz

Stop 2.480 750 GHz

#Res BW 10 kHz

#VBW 30 kHz

Sweep 14.36 ms (601 pts)

| Marker | Trace | Type | X Axis        | Amplitude  |
|--------|-------|------|---------------|------------|
| 1      | (1)   | Freq | 2.480 000 GHz | -7.46 dBm  |
| 2R     | (1)   | Freq | 2.479 356 GHz | -27.42 dBm |
| 2Δ     | (1)   | Freq | 1.239 MHz     | -0.07 dB   |



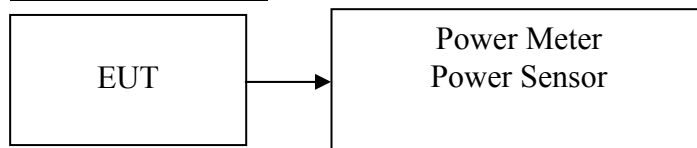
## 7.2 PEAK POWER

### LIMIT

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

1. According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, 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, provided the systems operate with an output power no greater than 125 mW.
2. According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.
3. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) 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 Power Meter. The Power Meter is set to the peak power detection.

### TEST RESULTS

*No non-compliance noted.*

**Test Data****For GFSK / DH5**

| Channel | Frequency (MHz) | Output Power (dBm) | Output Power (W) | Limit (W) | Result |
|---------|-----------------|--------------------|------------------|-----------|--------|
| Low     | 2402            | 0.80               | 0.00120          | 0.125     | PASS   |
| Mid     | 2441            | 0.72               | 0.00118          |           | PASS   |
| High    | 2480            | -0.21              | 0.00095          |           | PASS   |

**For 8DPSK / DH5**

| Channel | Frequency (MHz) | Output Power (dBm) | Output Power (W) | Limit (W) | Result |
|---------|-----------------|--------------------|------------------|-----------|--------|
| Low     | 2402            | 0.97               | 0.00125          | 0.125     | PASS   |
| Mid     | 2441            | 0.36               | 0.00109          |           | PASS   |
| High    | 2480            | -0.73              | 0.00085          |           | PASS   |

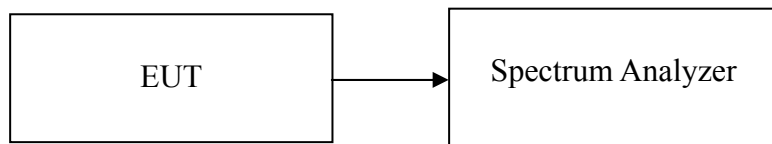


## 7.3 AVERAGE POWER

### LIMIT

None; for reporting purposes only.

### Test Configuration



### TEST PROCEDURE

The transmitter output is connected to the Spectrum analyzer. The Spectrum analyzer is set to the average power detection.

### TEST RESULTS

*No non-compliance noted.*

#### Test Data

##### **For GFSK / DH5**

| Channel | Frequency (MHz) | Output Power (dBm) | Output Power (W) |
|---------|-----------------|--------------------|------------------|
| Low     | 2402            | -5.15              | 0.00031          |
| Mid     | 2441            | -5.41              | 0.00029          |
| High    | 2480            | -6.35              | 0.00023          |

##### **For 8DPSK / DH5**

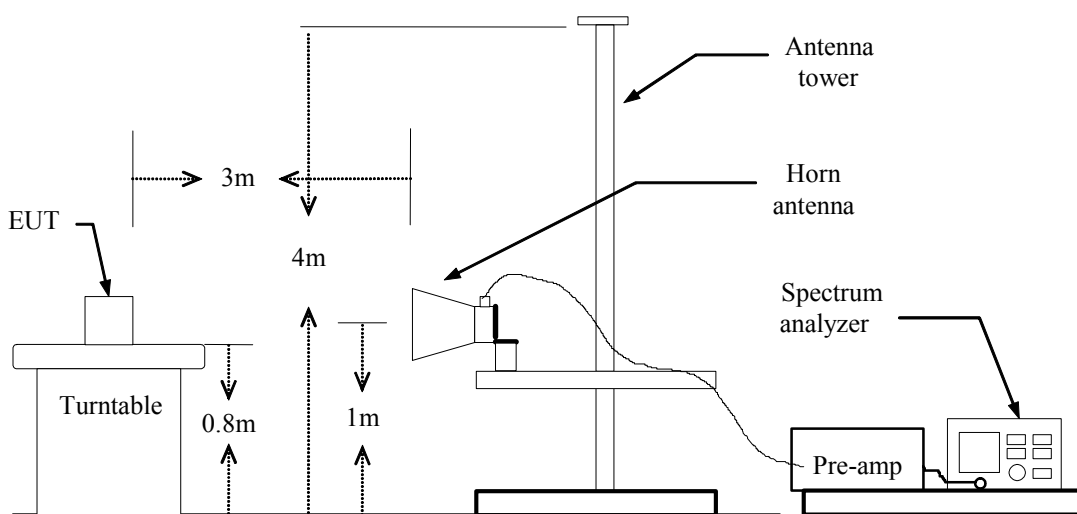
| Channel | Frequency (MHz) | Output Power (dBm) | Output Power (W) |
|---------|-----------------|--------------------|------------------|
| Low     | 2402            | -7.70              | 0.00017          |
| Mid     | 2441            | -8.33              | 0.00015          |
| High    | 2480            | -9.47              | 0.00011          |

## 7.4BAND EDGES MEASUREMENT

### LIMIT

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

### Test Configuration



### TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
  - (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
  - (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

### TEST RESULTS

Refer to attach spectrum analyzer data chart.

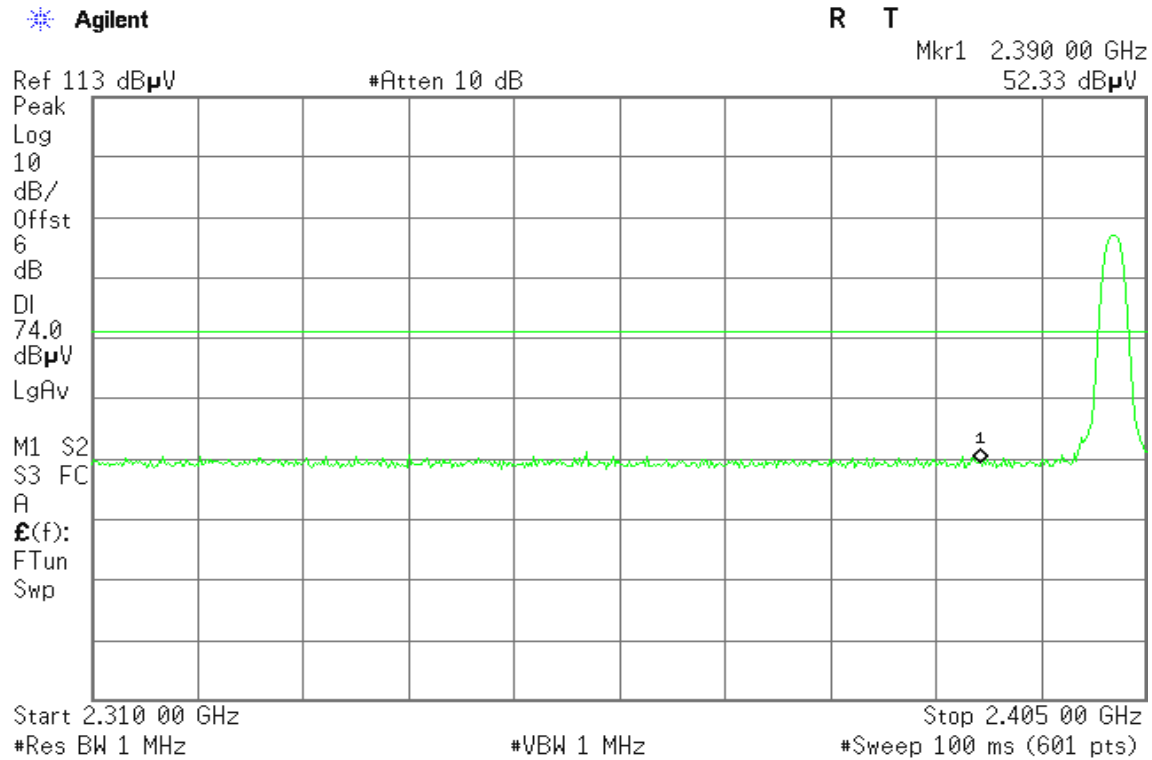


For GFSK / DH5

Band Edges (CH Low)

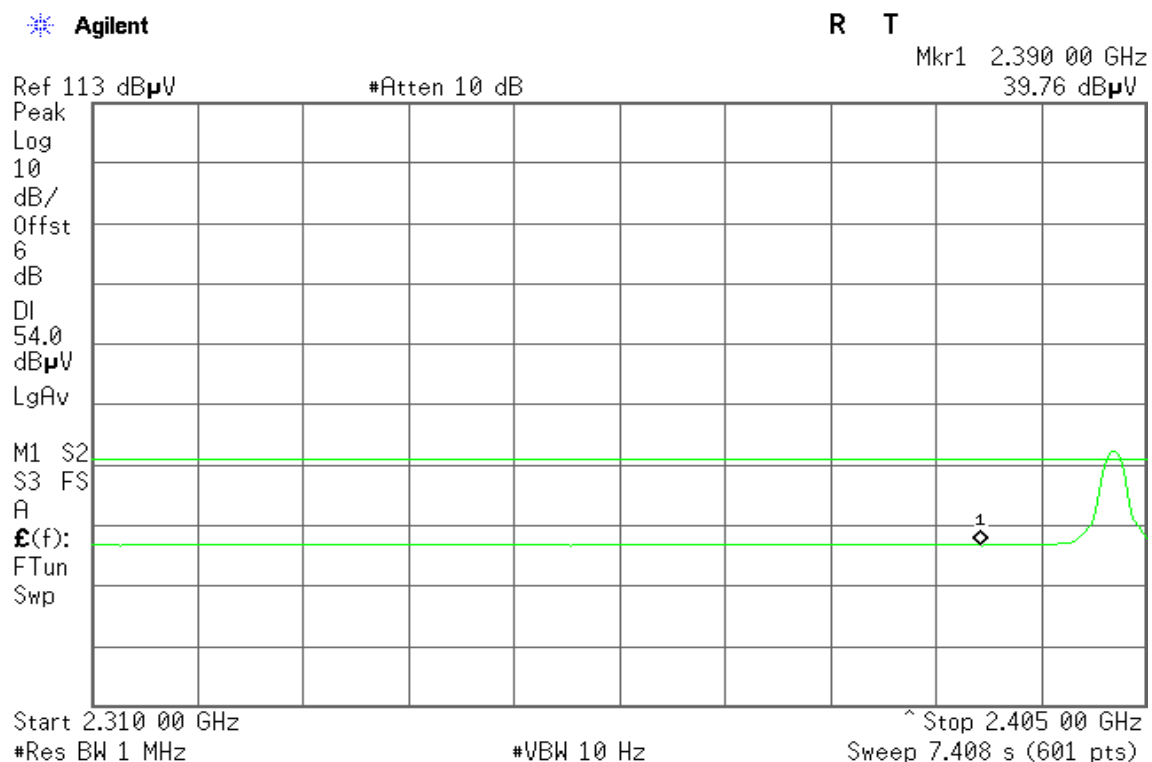
Detector mode: Peak

Polarity: Vertical



Detector mode: Average

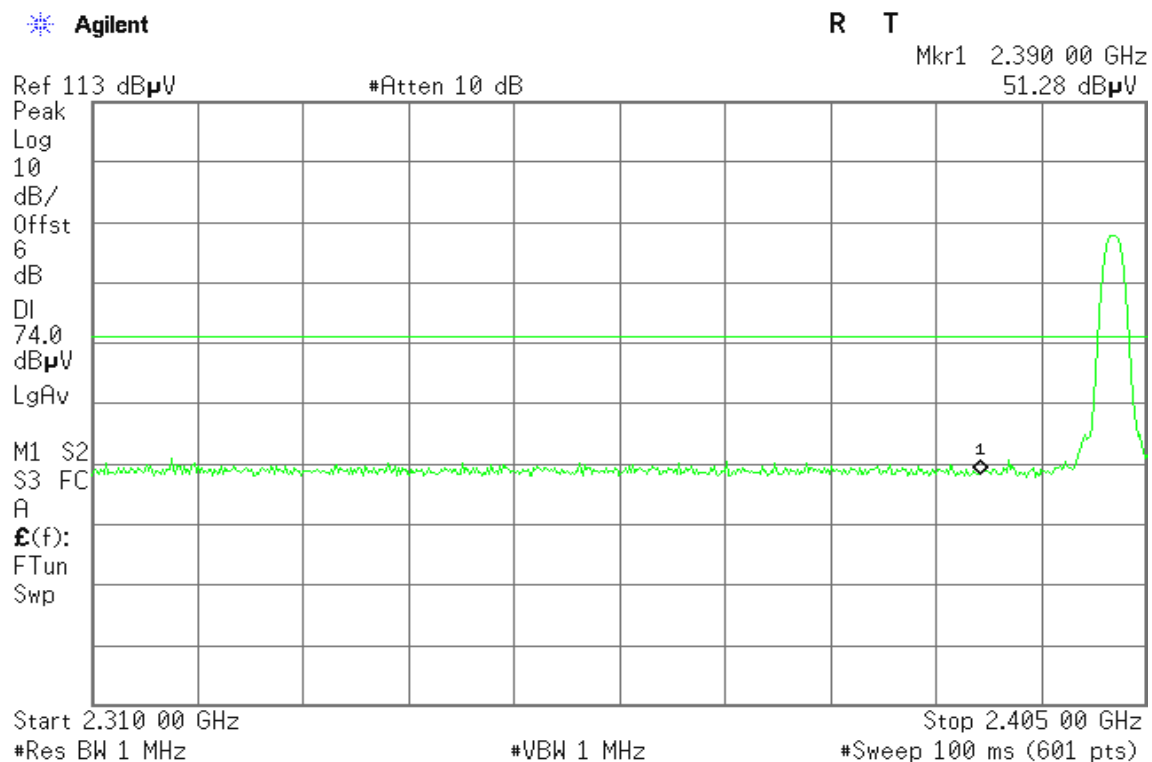
Polarity: Vertical





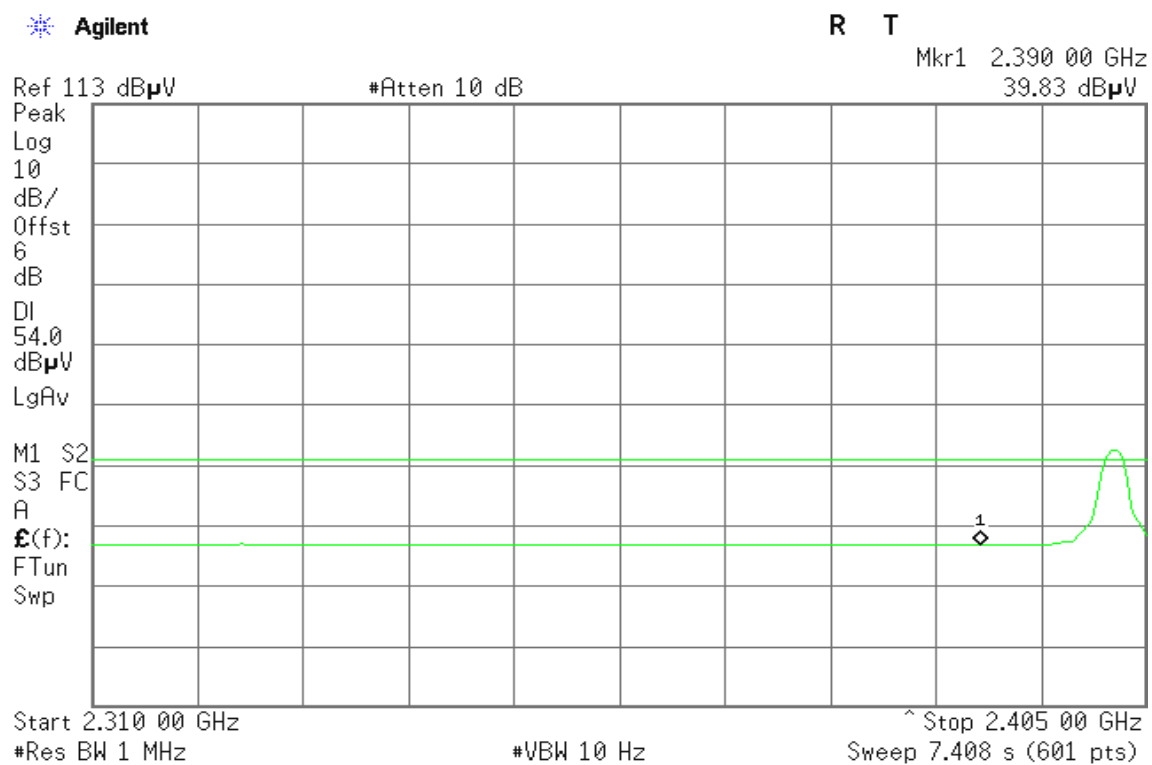
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

Polarity: Horizontal

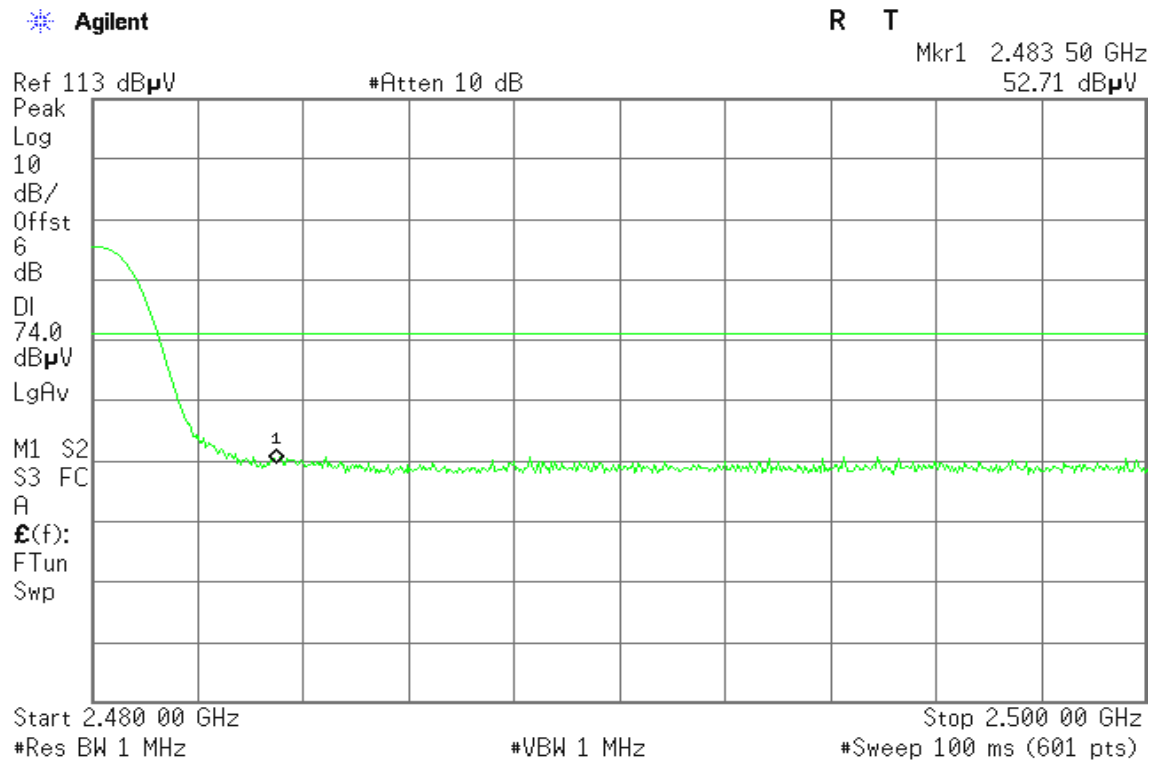




## Band Edges (CH High)

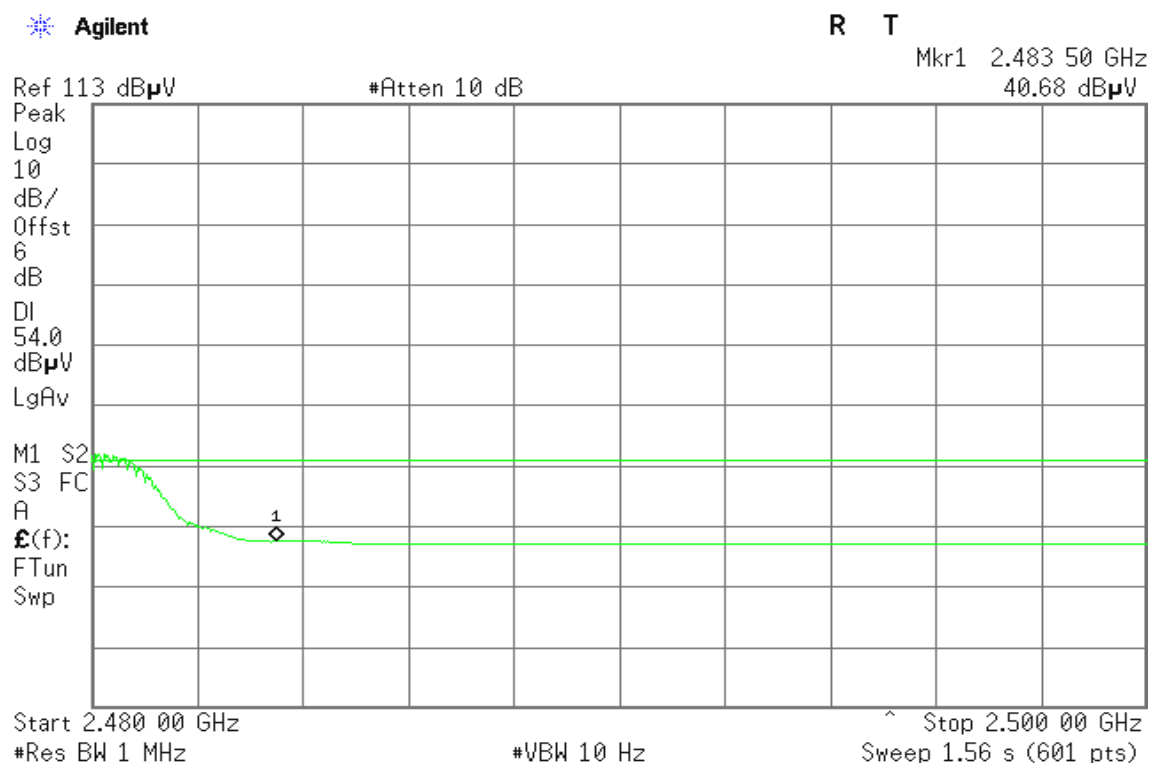
Detector mode: Peak

Polarity: Vertical



Detector mode: Average

Polarity: Vertical

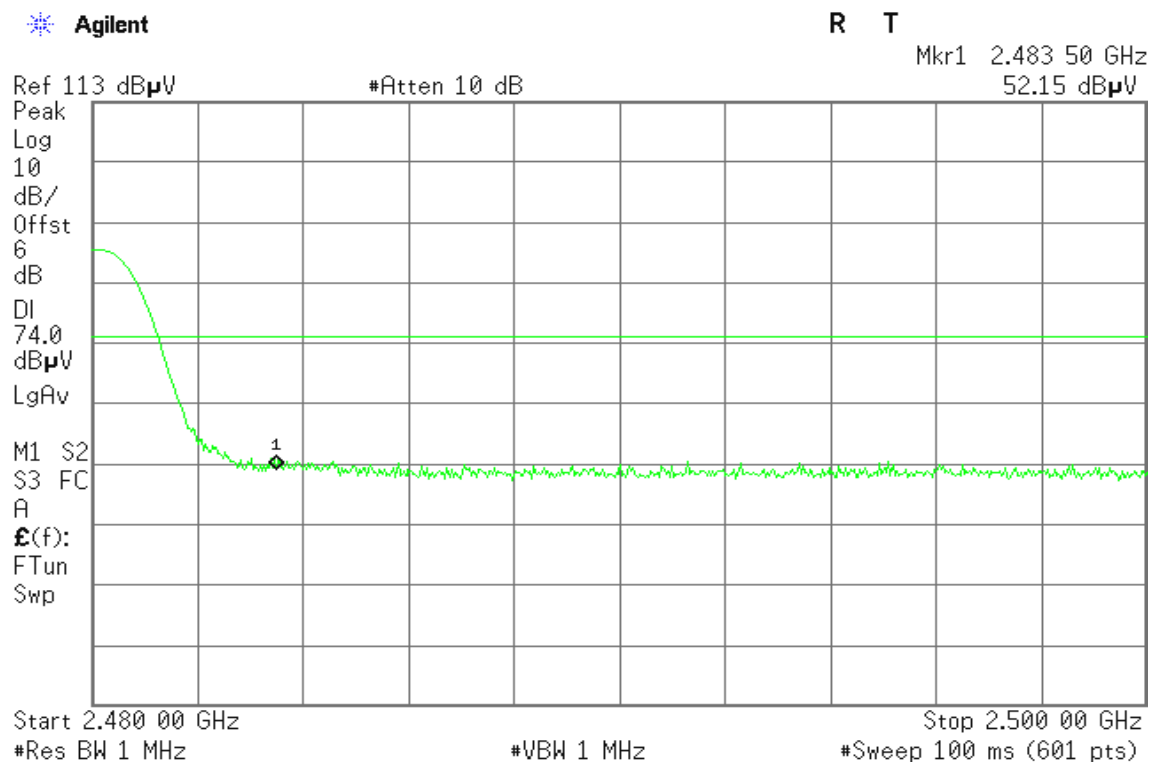






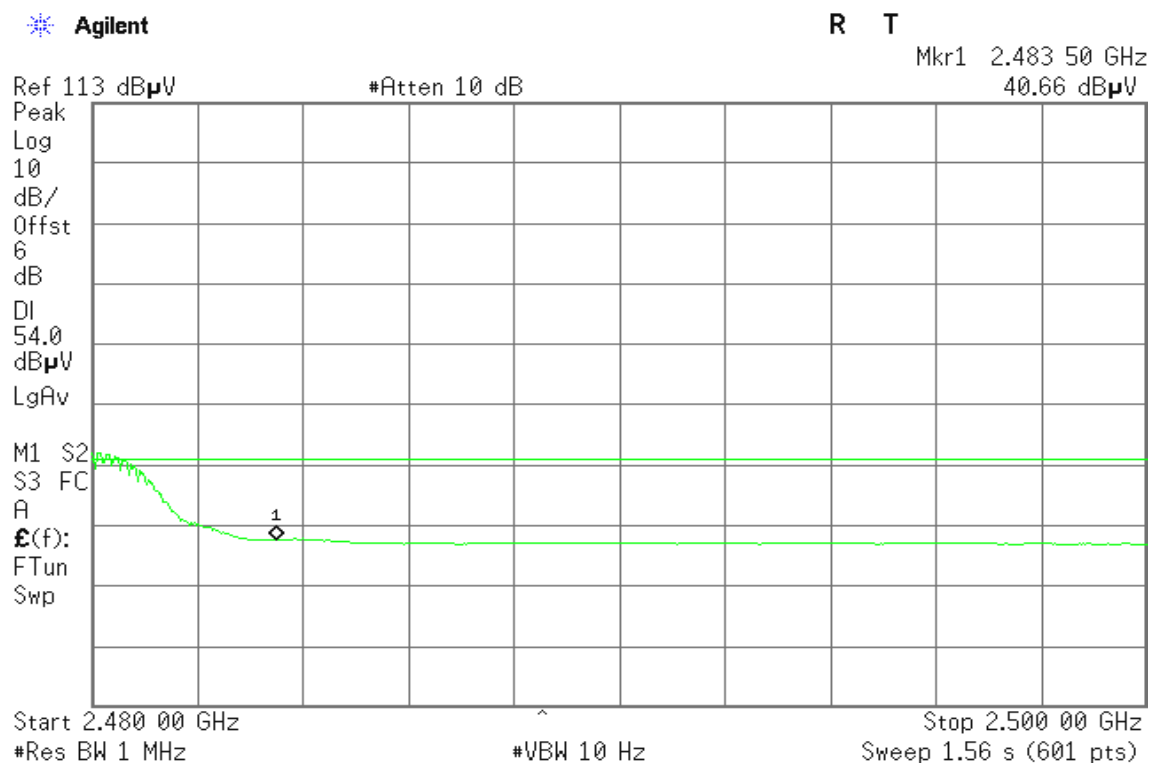
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

Polarity: Horizontal



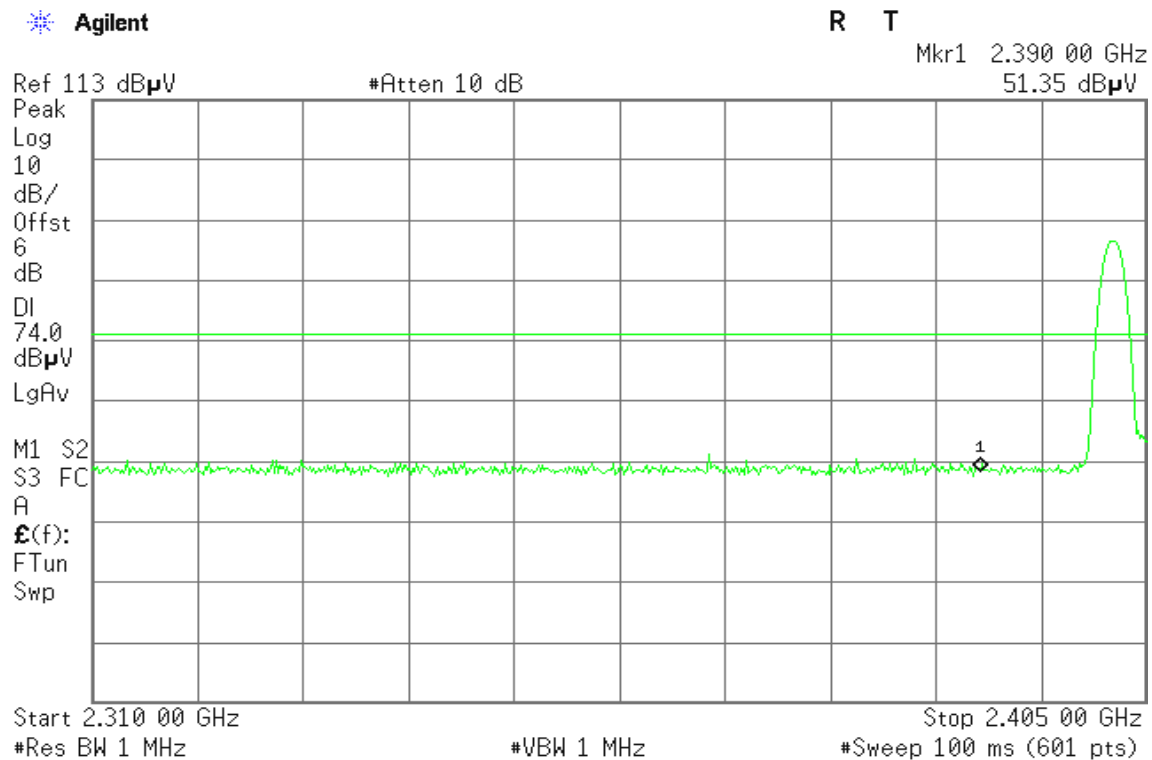


**For 8DPSK / DH5**

**Band Edges (CH Low)**

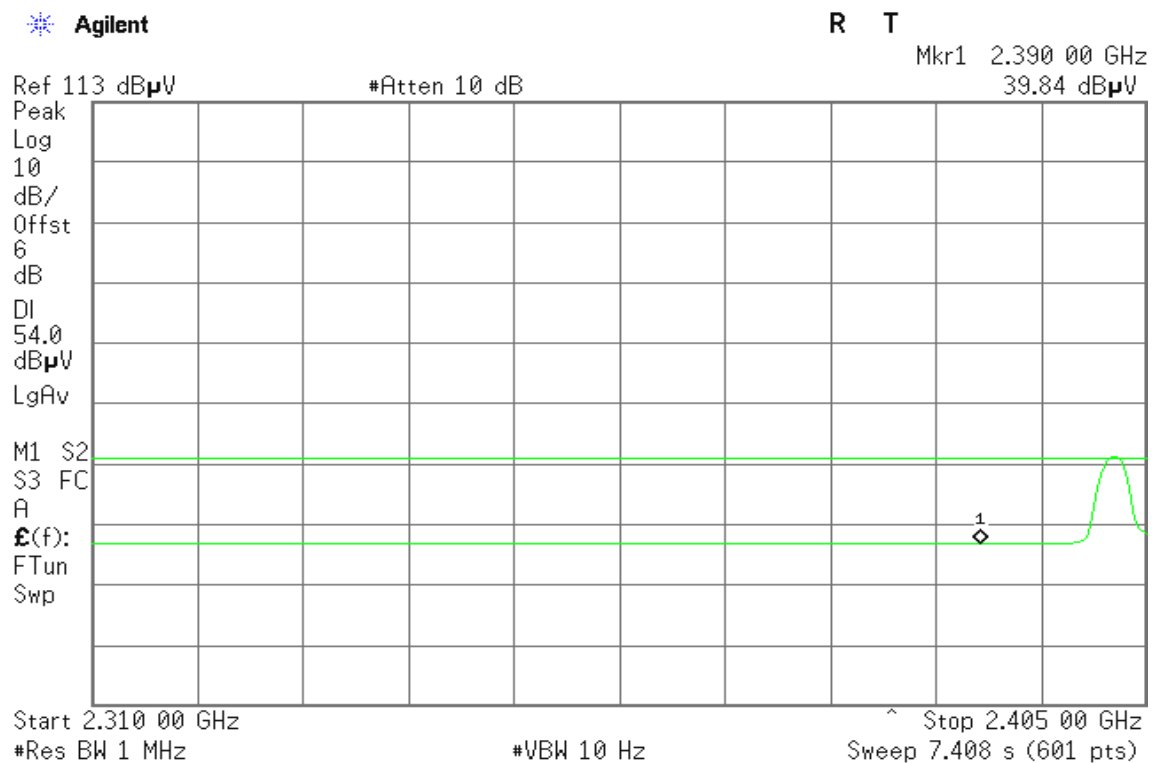
**Detector mode: Peak**

**Polarity: Vertical**



**Detector mode: Average**

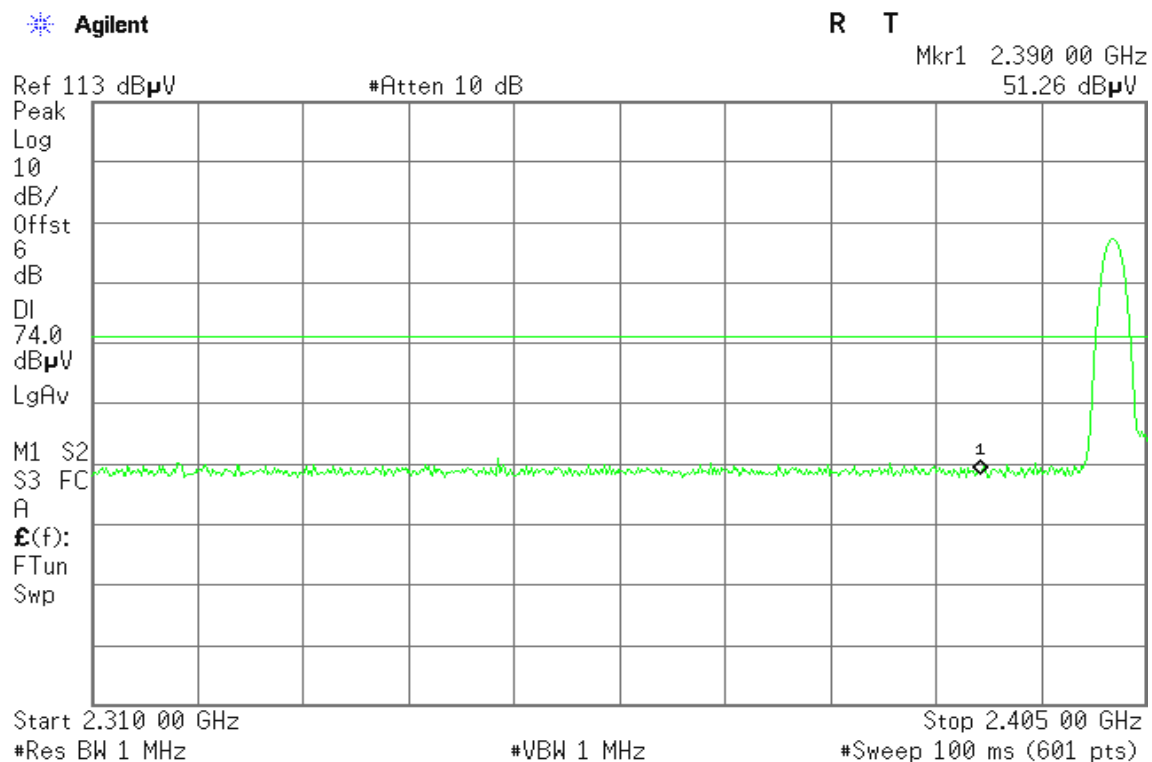
**Polarity: Vertical**





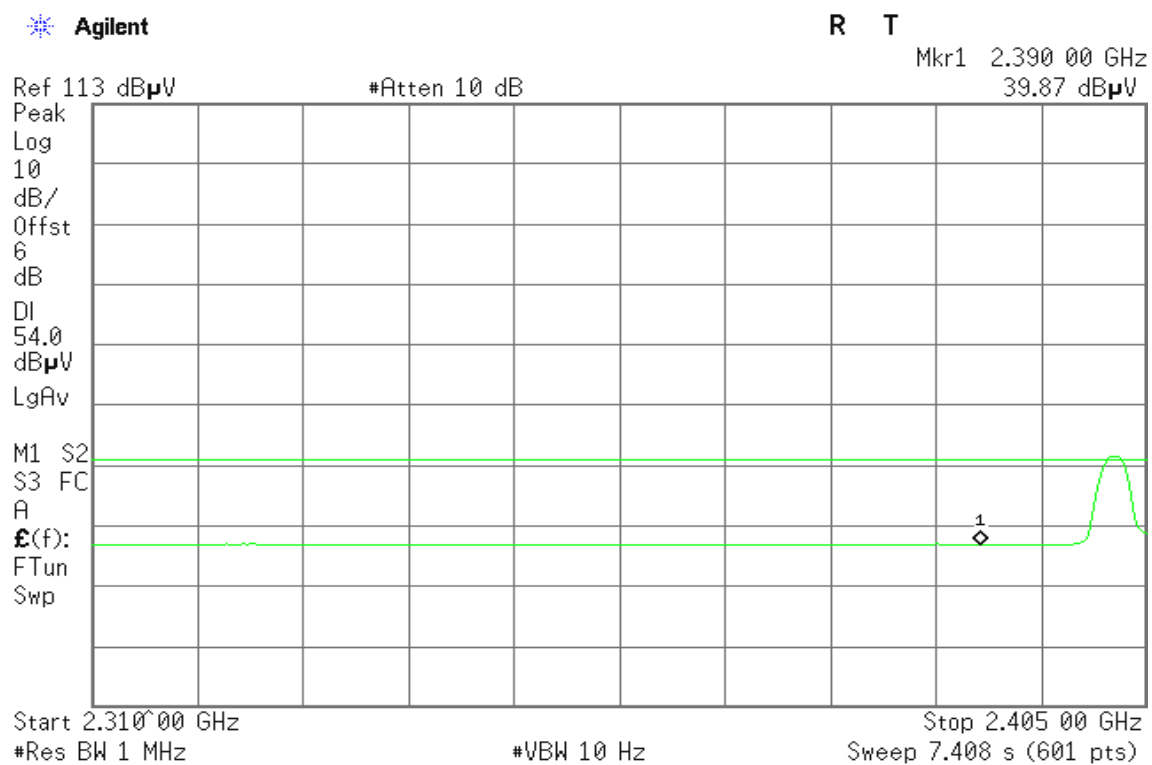
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

Polarity: Horizontal

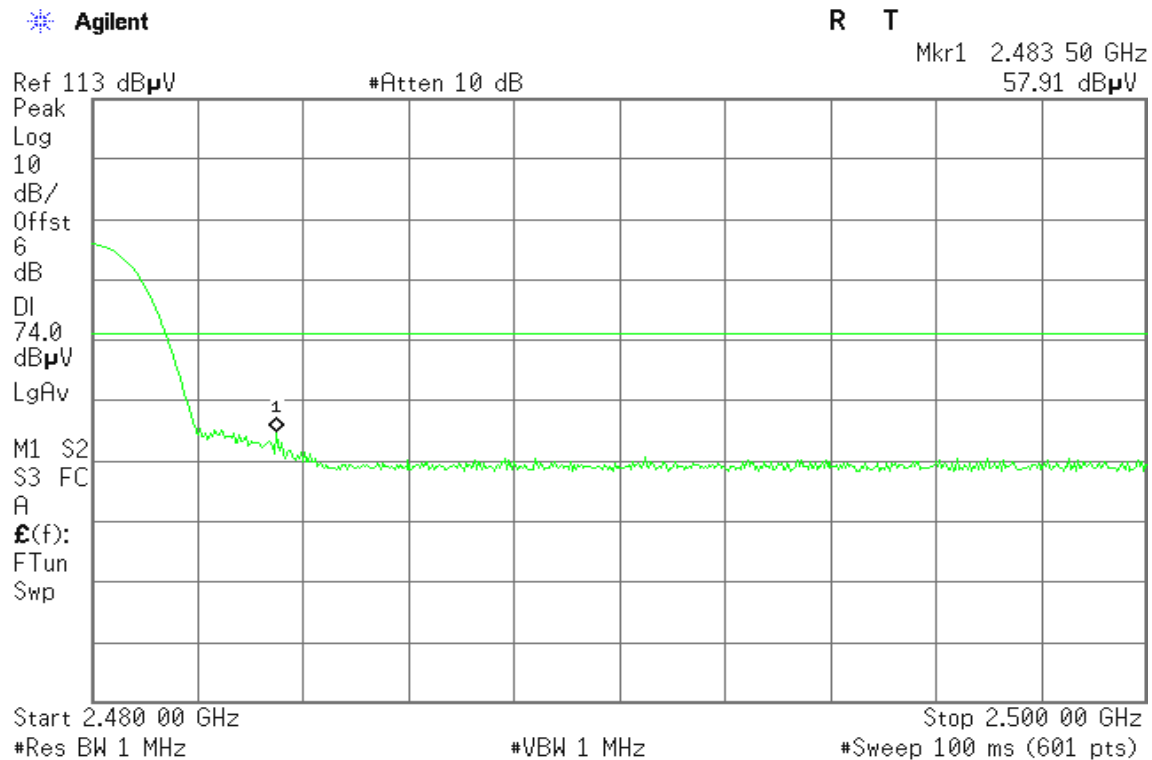




## Band Edges (CH High)

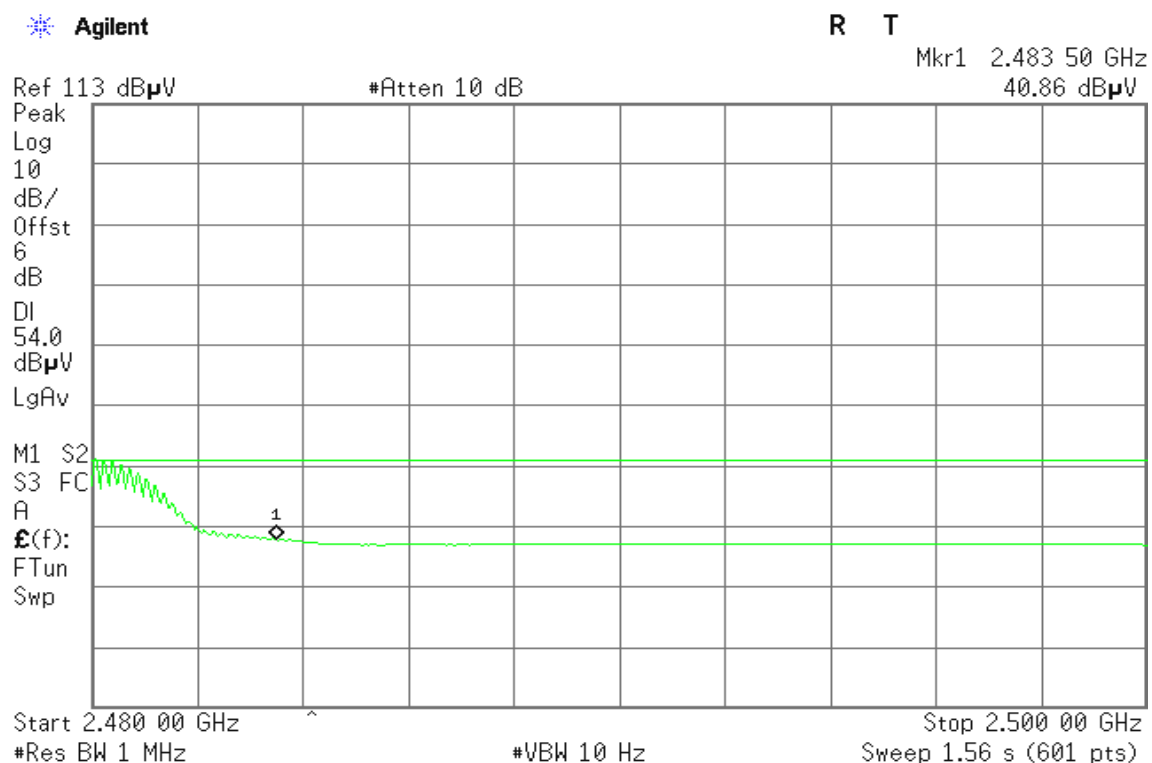
Detector mode: Peak

Polarity: Vertical



Detector mode: Average

Polarity: Vertical





Detector mode: Peak

Polarity: Horizontal

Agilent

R T

Mkr1 2.483 50 GHz  
53.83 dB $\mu$ V

Ref 113 dB $\mu$ V

#Atten 10 dB

Peak

Log

10

dB/

Offst

6

dB

DI

74.0

dB $\mu$ V

LgAv

M1 S2

S3 FC

A

$\mathcal{E}(f)$ :

FTun

Swp

Start 2.480 00 GHz

#Res BW 1 MHz

#VBW 1 MHz

Stop 2.500 00 GHz

#Sweep 100 ms (601 pts)

Detector mode: Average

Polarity: Horizontal

Agilent

R T

Mkr1 2.483 50 GHz  
40.84 dB $\mu$ V

Ref 113 dB $\mu$ V

#Atten 10 dB

Peak

Log

10

dB/

Offst

6

dB

DI

54.0

dB $\mu$ V

LgAv

M1 S2

S3 FC

A

$\mathcal{E}(f)$ :

FTun

Swp

Start 2.480 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Stop 2.500 00 GHz

Sweep 1.56 s (601 pts)

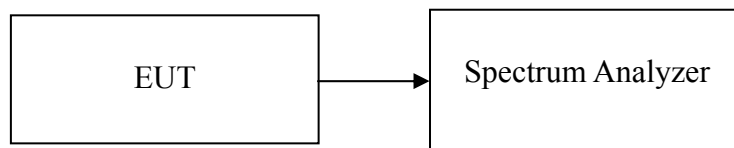


## 7.5 FREQUENCY SEPARATION

### LIMIT

According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, 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, provided the systems operate with an output power no greater than 125 mW.

### Test Configuration



### TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = middle of hopping channel.
4. Set the spectrum analyzer as RBW = 30kHz, VBW = 100kHz, Span = 3MHz, Sweep = auto.
5. Max hold, mark 3 peaks of hopping channel and record the 3 peaks frequency.

### TEST RESULTS

*No non-compliance noted*

**Test Data****For GFSK / DH5**

| <b>Channel Separation<br/>(MHz)</b> | <b>two-thirds of the 20 dB<br/>bandwidth</b> | <b>Channel Separation Limit</b>    | <b>Result</b> |
|-------------------------------------|--|------------------------------------|---------------|
| 1.00                                | 619.3  | >two-thirds of the 20 dB bandwidth | Pass          |

**For 8DPSK / DH5**

| <b>Channel Separation<br/>(MHz)</b> | <b>two-thirds of the 20 dB<br/>bandwidth</b> | <b>Channel Separation Limit</b>    | <b>Result</b> |
|-------------------------------------|--|------------------------------------|---------------|
| 1.00                                | 830  | >two-thirds of the 20 dB bandwidth | Pass          |



## Test Plot

### For GFSK / DH5

### Measurement of Channel Separation

Agilent 15:52:26 Nov 17, 2009

R T

Mkr3 2.442 010 GHz

-1.94 dBm

Ref 16.6 dBm

#Atten 20 dB

#Peak

Log

10

dB/

Offst

6.6

dB

LgAv

V1 S2

Center 2.441 000 GHz

Span 3 MHz

#Res BW 30 kHz

#VBW 100 kHz

Sweep 3.2 ms (601 pts)

| Marker | Trace | Type | X Axis        | Amplitude |
|--------|-------|------|---------------|-----------|
| 1      | (1)   | Freq | 2.440 010 GHz | -1.98 dBm |
| 2      | (1)   | Freq | 2.441 010 GHz | -2.82 dBm |
| 3      | (1)   | Freq | 2.442 010 GHz | -1.94 dBm |

### Measurement of 20dB Bandwidth

Agilent 10:27:52 Oct 6, 2009

R T

Δ Mkr2 929 kHz

0.10 dB

Ref 16.6 dBm

#Atten 20 dB

#Peak

Log

10

dB/

Offst

6.6

dB

DI

-25.6

dBm

LgAv

V1 S2

Center 2.480 000 GHz

Span 1.5 MHz

#Res BW 10 kHz

#VBW 30 kHz

Sweep 14.36 ms (601 pts)

| Marker | Trace | Type | X Axis        | Amplitude  |
|--------|-------|------|---------------|------------|
| 1      | (1)   | Freq | 2.480 003 GHz | -5.62 dBm  |
| 2R     | (1)   | Freq | 2.479 535 GHz | -25.42 dBm |
| 2Δ     | (1)   | Freq | 929 kHz       | 0.10 dB    |



**For 8DPSK / DH5****Measurement of Channel Separation**

\* Agilent 15:54:46 Nov 17, 2009

R T

Mkr3 2.441 990 GHz

Ref 16.6 dBm

#Atten 20 dB

-2.22 dBm



Center 2.441 000 GHz

Span 3 MHz

#Res BW 30 kHz

#VBW 100 kHz

Sweep 3.2 ms (601 pts)

| Marker | Trace | Type | X Axis        | Amplitude |
|--------|-------|------|---------------|-----------|
| 1      | (1)   | Freq | 2.439 990 GHz | -0.99 dBm |
| 2      | (1)   | Freq | 2.440 990 GHz | -2.87 dBm |
| 3      | (1)   | Freq | 2.441 990 GHz | -2.22 dBm |

**Measurement of 20dB Bandwidth**

\* Agilent 10:25:35 Oct 6, 2009

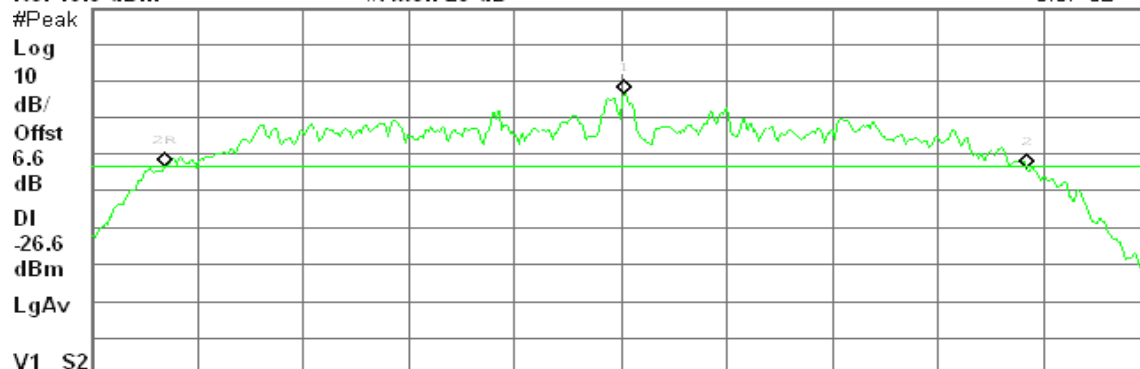
R T

Δ Mkr2 1.245 MHz

Ref 16.6 dBm

#Atten 20 dB

-0.37 dB



Center 2.441 000 GHz

Span 1.5 MHz

#Res BW 10 kHz

#VBW 30 kHz

Sweep 14.36 ms (601 pts)

| Marker | Trace | Type | X Axis        | Amplitude  |
|--------|-------|------|---------------|------------|
| 1      | (1)   | Freq | 2.441 005 GHz | -6.57 dBm  |
| 2R     | (1)   | Freq | 2.440 351 GHz | -26.80 dBm |
| 2Δ     | (1)   | Freq | 1.245 MHz     | -0.37 dB   |

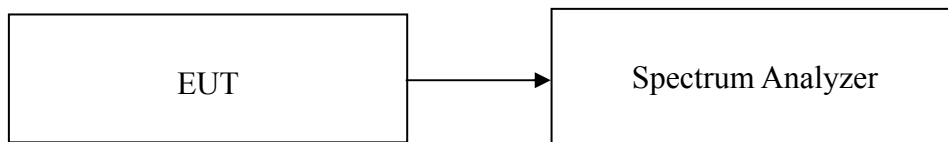


## 7.6 NUMBER OF HOPPING FREQUENCY

### LIMIT

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

### Test Configuration



### TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set spectrum analyzer Start=2400MHz, Stop = 2441.5MHz, Sweep = auto and Start=2441.5MHz, Stop = 2483.5MHz, Sweep = auto.
4. Set the spectrum analyzer as RBW, VBW=510kHz.
5. Max hold, view and count how many channel in the band.

### TEST RESULTS

*No non-compliance noted*

### Test Data

**For GFSK / 8DPSK**

| Result (No. of CH) | Limit (No. of CH) | Result |
|--------------------|-------------------|--------|
| 79                 | >15               | PASS   |



## Test Plot

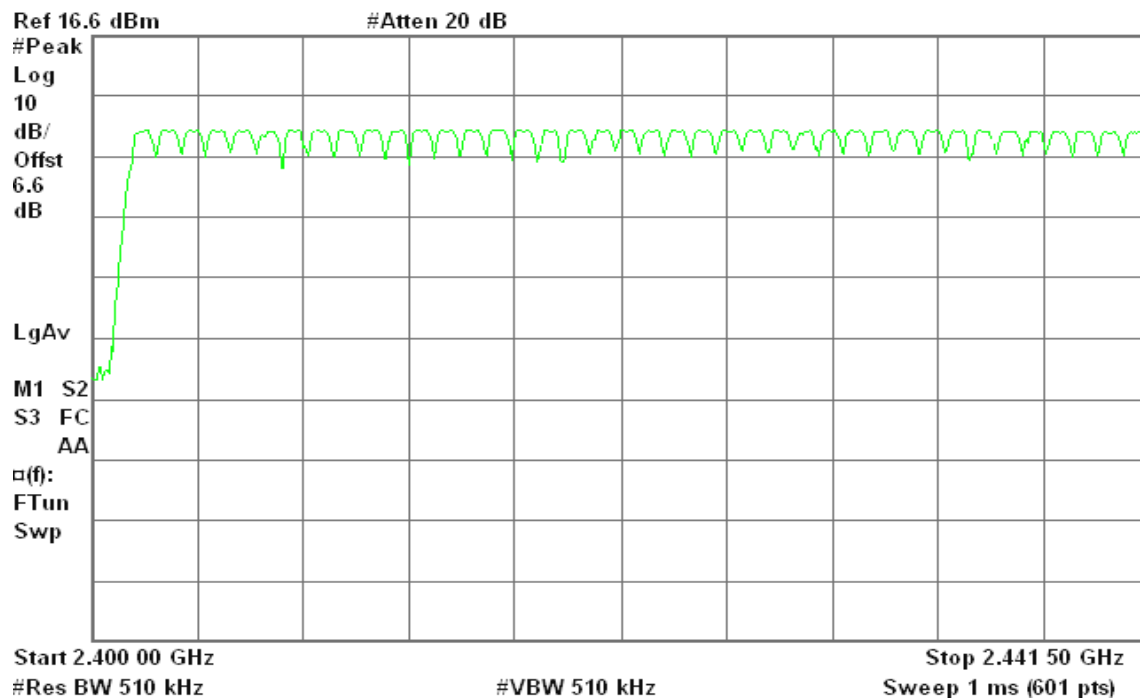
## For GFSK

## Channel Number

## 2.4 GHz – 2.4415 GHz

Agilent 11:12:58 Oct 6, 2009

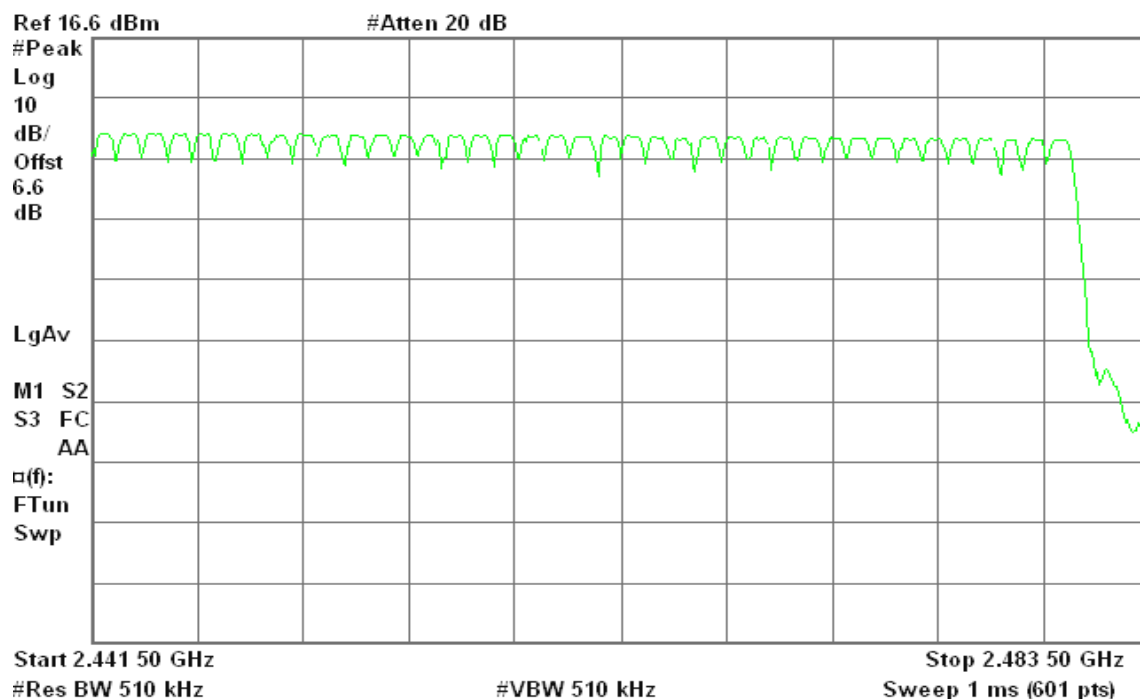
R T



## 2.4415 GHz – 2.4835 GHz

Agilent 11:13:50 Oct 6, 2009

R T





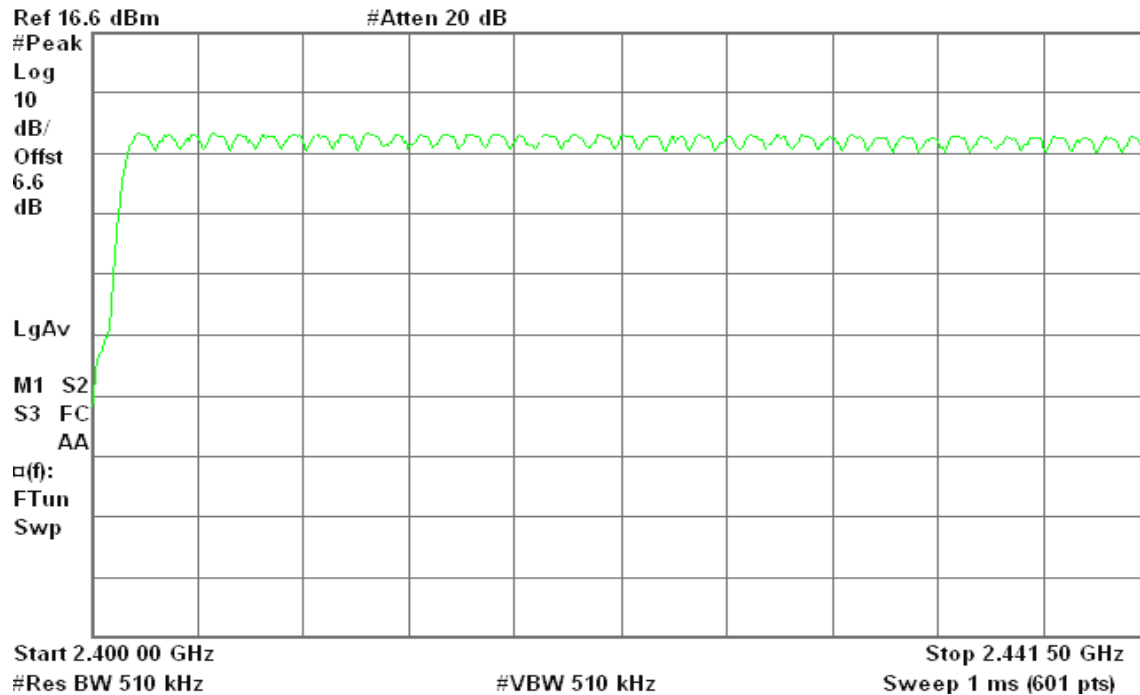
## For 8DPSK

### Channel Number

### 2.4 GHz – 2.4415 GHz

Agilent 11:24:45 Oct 6, 2009

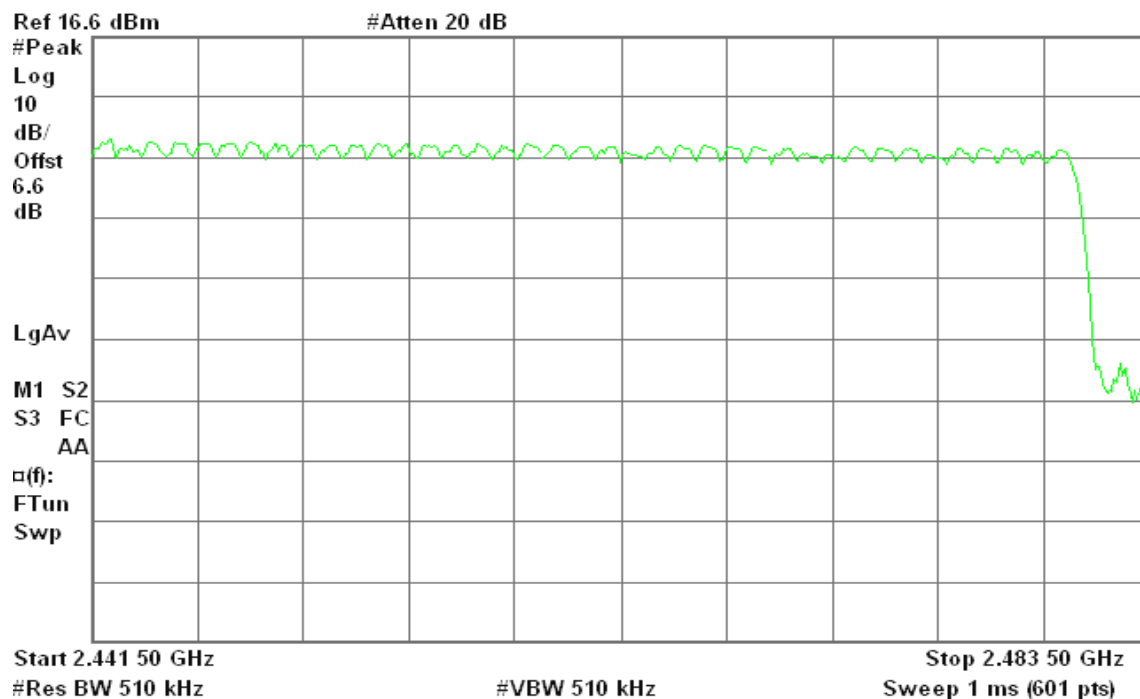
R T



### 2.4415 GHz – 2.4835 GHz

Agilent 11:18:54 Oct 6, 2009

R T



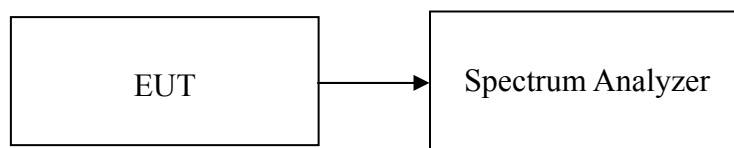


## **7.7 TIME OF OCCUPANCY (DWELL TIME)**

### **LIMIT**

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-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**

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW, VBW=1MHz, Span = 0Hz, Sweep = auto.
5. Repeat above procedures until all frequency measured were complete.

### **TEST RESULTS**

*No non-compliance noted*

**Test Data****For GFSK****DH 1**CH Low:  $0.400 * (1600/2)/79 * 31.6 = 128.00$  (ms)CH Mid:  $0.400 * (1600/2)/79 * 31.6 = 128.00$  (ms)CH High:  $0.400 * (1600/2)/79 * 31.6 = 128.00$  (ms)

| CH   | Pulse Time<br>(ms) | Total of Dwell<br>(ms) | Period Time<br>(s) | Limit<br>(ms) | Result |
|------|--------------------|------------------------|--------------------|---------------|--------|
| Low  | 0.400              | 128.00                 | 31.60              | 400.00        | PASS   |
| Mid  | 0.400              | 128.00                 | 31.60              |               | PASS   |
| High | 0.400              | 128.00                 | 31.60              |               | PASS   |

**DH 3**CH Low:  $1.667 * (1600/4)/79 * 31.6 = 266.72$  (ms)CH Mid:  $1.633 * (1600/4)/79 * 31.6 = 261.28$  (ms)CH High:  $1.667 * (1600/4)/79 * 31.6 = 266.72$  (ms)

| CH   | Pulse Time<br>(ms) | Total of Dwell<br>(ms) | Period Time<br>(s) | Limit<br>(ms) | Result |
|------|--------------------|------------------------|--------------------|---------------|--------|
| Low  | 1.667              | 266.72                 | 31.60              | 400.00        | PASS   |
| Mid  | 1.633              | 261.28                 | 31.60              |               | PASS   |
| High | 1.667              | 266.72                 | 31.60              |               | PASS   |

**DH 5**CH Low:  $2.900 * (1600/6)/79 * 31.6 = 309.33$  (ms)CH Mid:  $2.900 * (1600/6)/79 * 31.6 = 309.33$  (ms)CH High:  $2.900 * (1600/6)/79 * 31.6 = 309.33$  (ms)

| CH   | Pulse Time<br>(ms) | Total of Dwell<br>(ms) | Period Time<br>(s) | Limit<br>(ms) | Result |
|------|--------------------|------------------------|--------------------|---------------|--------|
| Low  | 2.900              | 309.33                 | 31.60              | 400.00        | PASS   |
| Mid  | 2.900              | 309.33                 | 31.60              |               | PASS   |
| High | 2.900              | 309.33                 | 31.60              |               | PASS   |



## Test Plot

## For GFSK

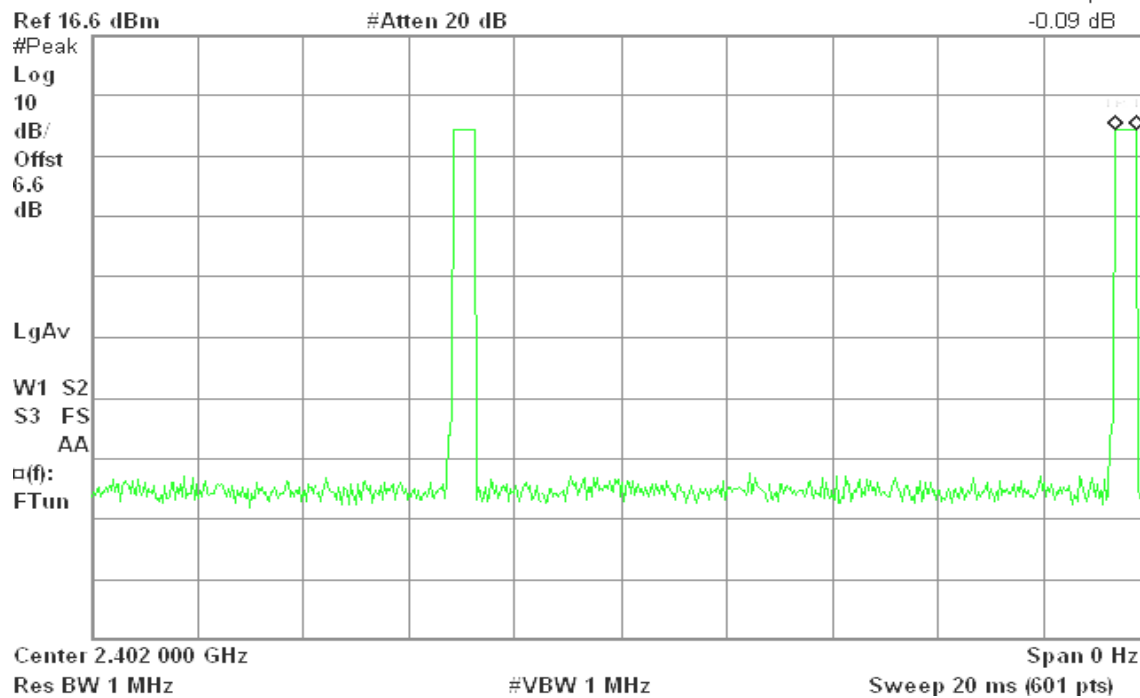
## DH 1

## CH Low

Agilent 10:50:16 Oct 6, 2009

R T

$\Delta$  Mkr1 400  $\mu$ s  
-0.09 dB

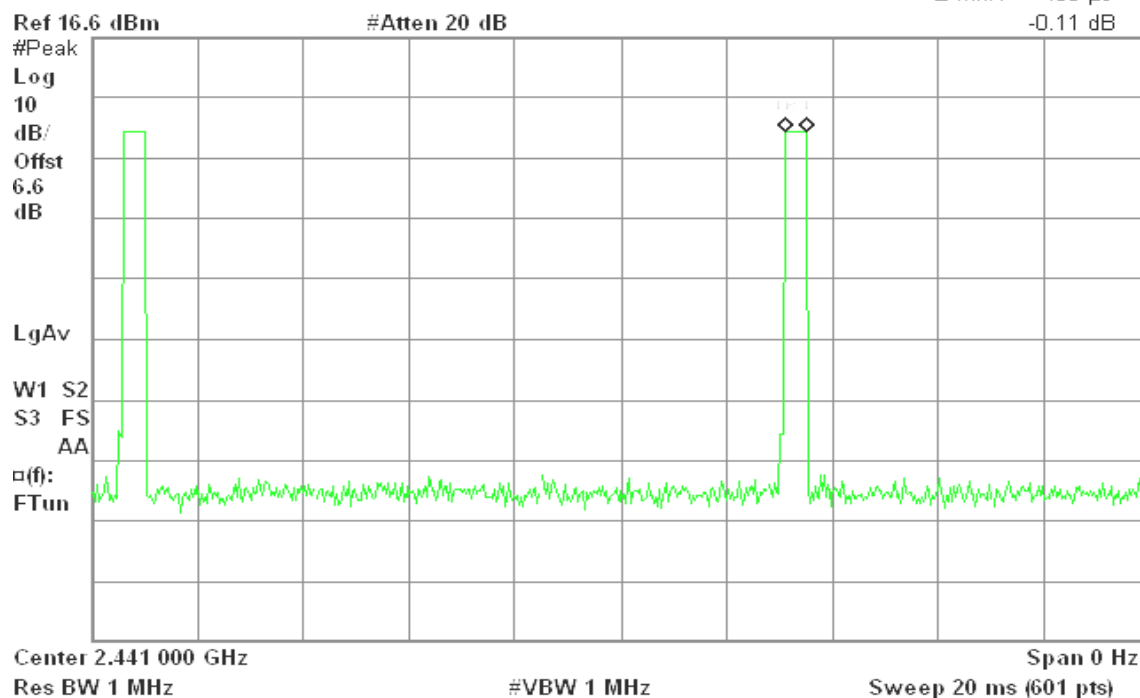


## CH Mid

Agilent 10:49:38 Oct 6, 2009

R T

$\Delta$  Mkr1 400  $\mu$ s  
-0.11 dB



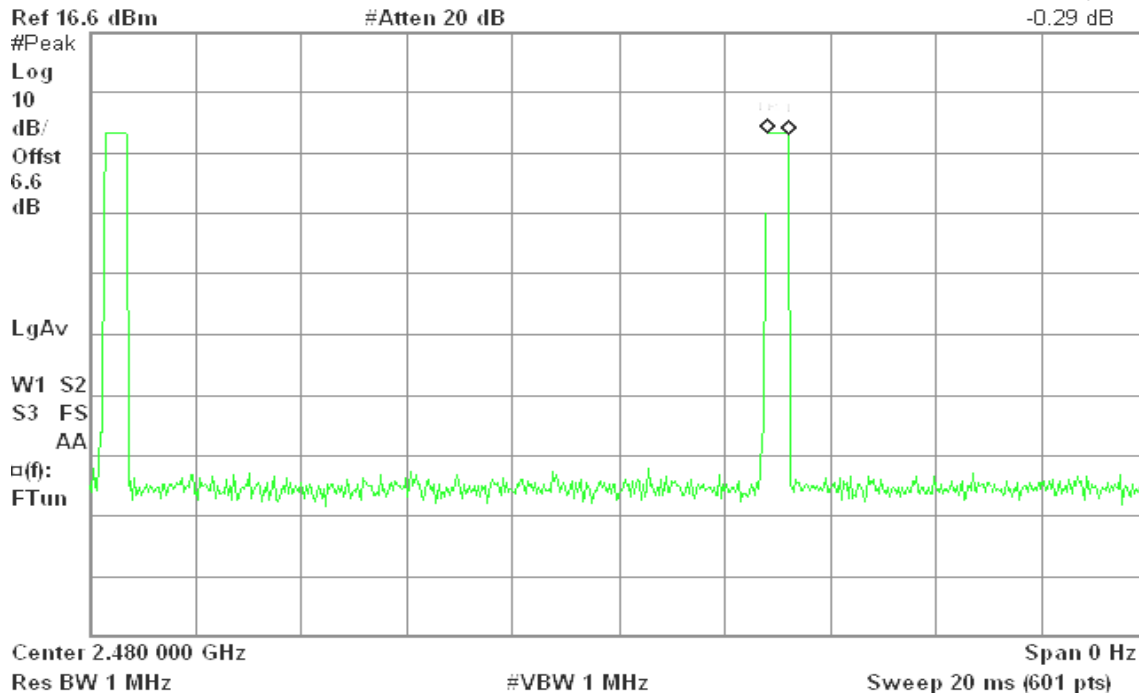


## CH High

Agilent 10:47:35 Oct 6, 2009

R T

Δ Mkr1 400 μs  
-0.29 dB



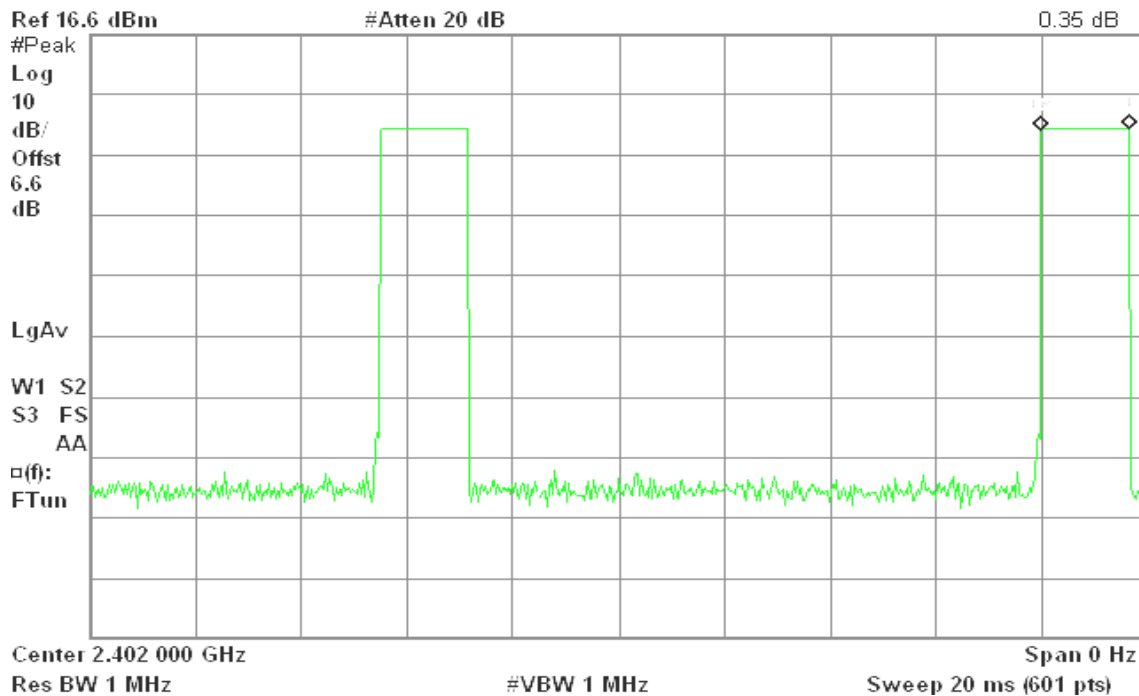
## DH 3

### CH Low

Agilent 10:50:39 Oct 6, 2009

R T

Δ Mkr1 1.667 ms  
0.35 dB





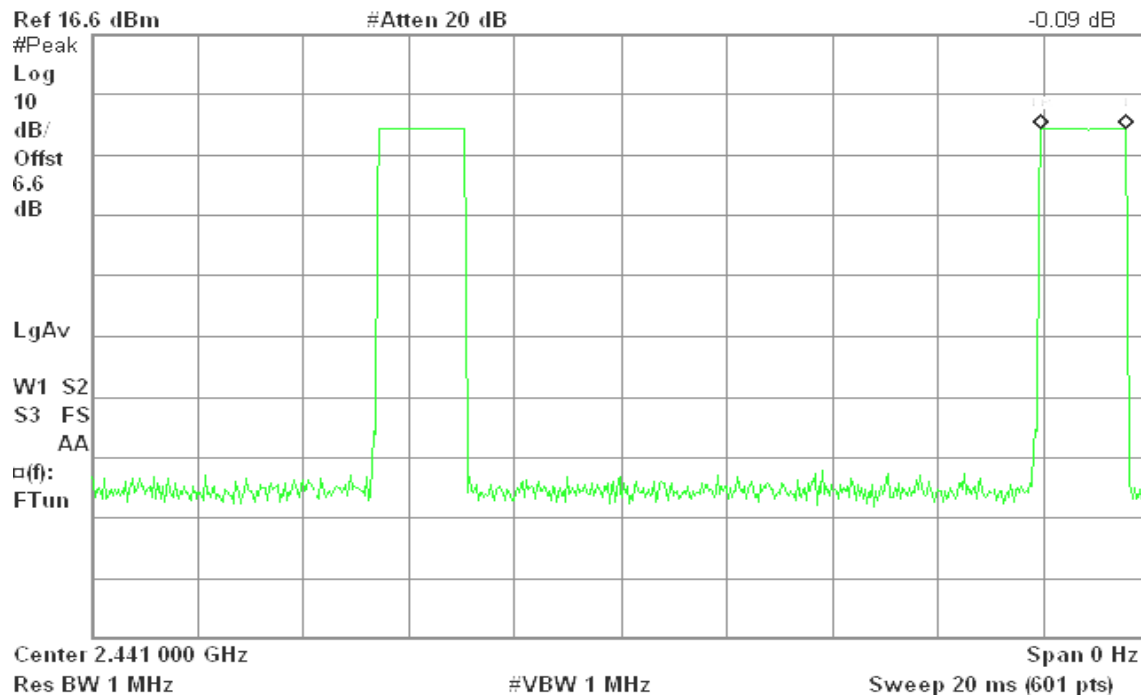


## CH Mid

Agilent 10:49:15 Oct 6, 2009

R T

Δ Mkr1 1.633 ms  
-0.09 dB

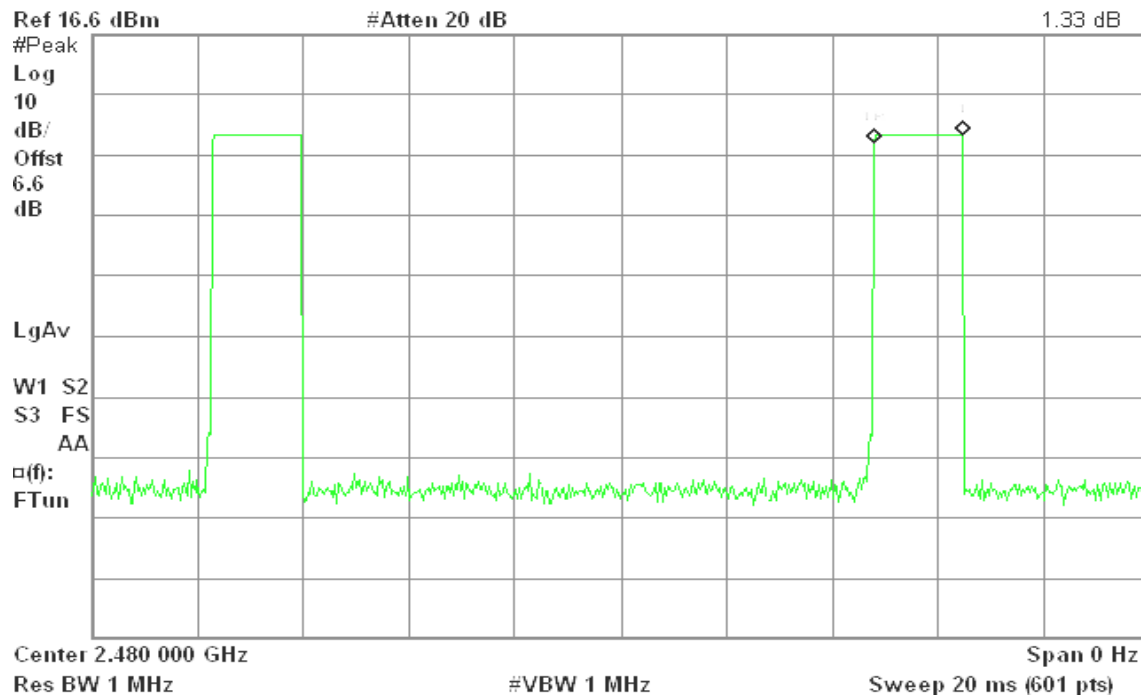


## CH High

Agilent 10:47:58 Oct 6, 2009

R T

Δ Mkr1 1.667 ms  
1.33 dB





## DH 5

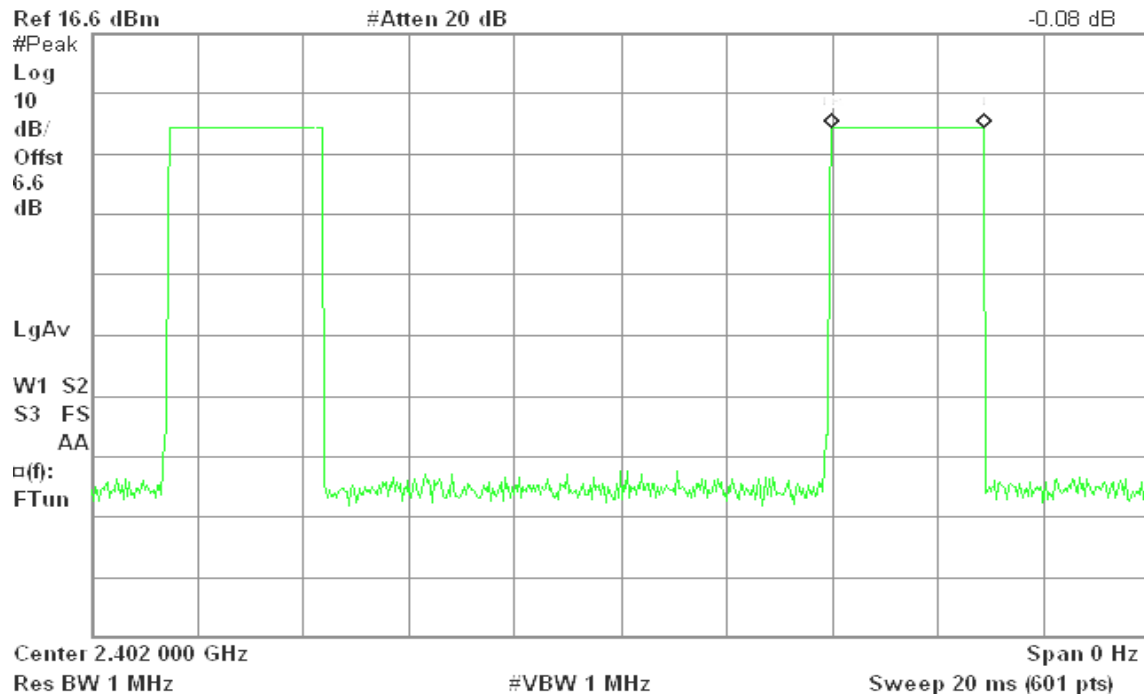
### CH Low

Agilent 10:51:04 Oct 6, 2009

R T

Δ Mkr1 2.9 ms

-0.08 dB



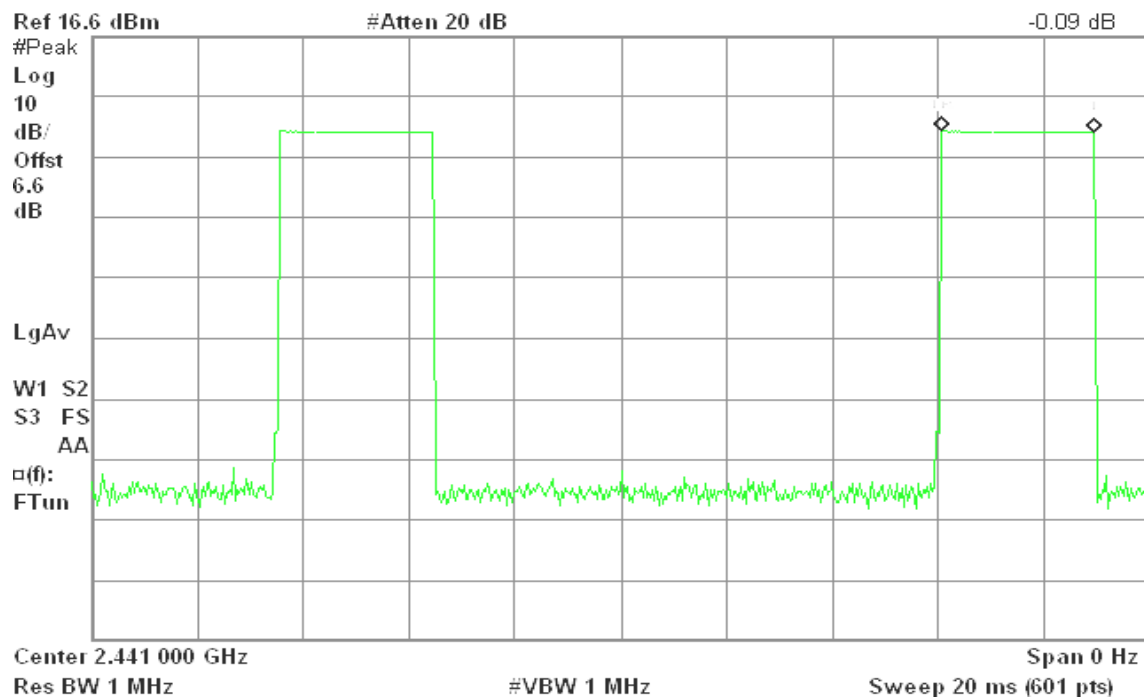
### CH Mid

Agilent 10:48:52 Oct 6, 2009

R T

Δ Mkr1 2.9 ms

-0.09 dB

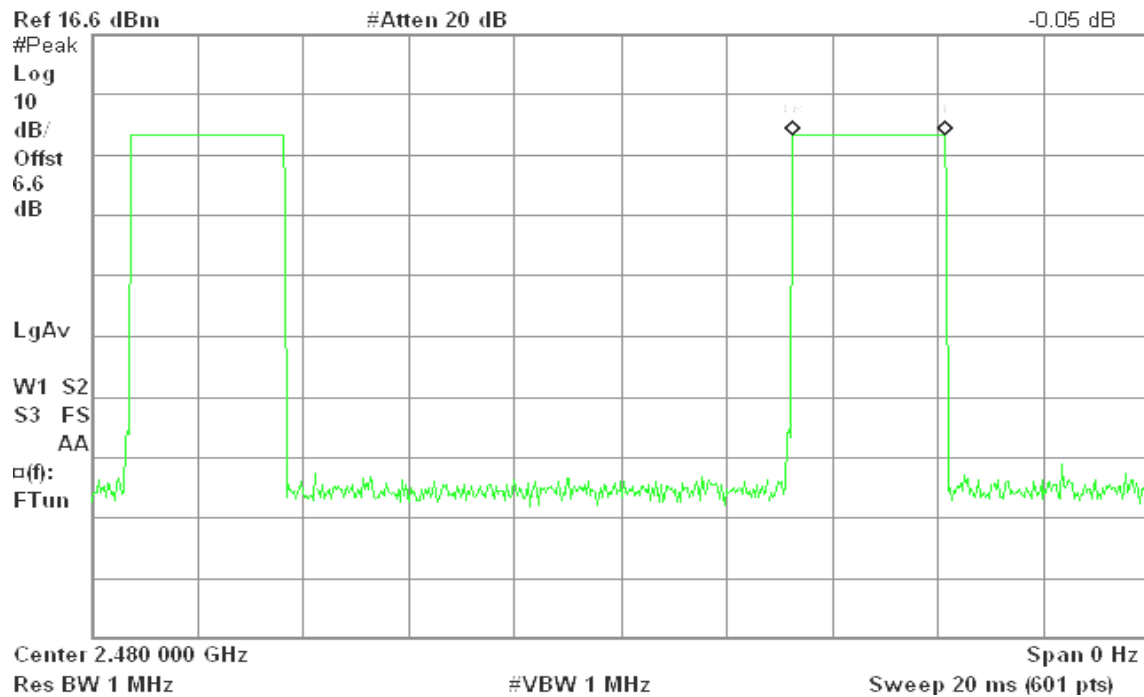


## CH High

Agilent 10:48:22 Oct 6, 2009

R T

$\Delta$  Mkr1    2.9 ms  
-0.05 dB



**Test Data****For 8DPSK****DH 1**CH Low:  $0.433 * (1600/2)/79 * 31.6 = 138.56$  (ms)CH Mid:  $0.400 * (1600/2)/79 * 31.6 = 128.00$  (ms)CH High:  $0.400 * (1600/2)/79 * 31.6 = 128.00$  (ms)

| CH   | Pulse Time<br>(ms) | Total of Dwell<br>(ms) | Period Time<br>(s) | Limit<br>(ms) | Result |
|------|--------------------|------------------------|--------------------|---------------|--------|
| Low  | 0.433              | 138.56                 | 31.60              | 400.00        | PASS   |
| Mid  | 0.400              | 128.00                 | 31.60              |               | PASS   |
| High | 0.400              | 128.00                 | 31.60              |               | PASS   |

**DH 3**CH Low:  $1.667 * (1600/4)/79 * 31.6 = 266.72$  (ms)CH Mid:  $1.667 * (1600/4)/79 * 31.6 = 266.72$  (ms)CH High:  $1.667 * (1600/4)/79 * 31.6 = 266.72$  (ms)

| CH   | Pulse Time<br>(ms) | Total of Dwell<br>(ms) | Period Time<br>(s) | Limit<br>(ms) | Result |
|------|--------------------|------------------------|--------------------|---------------|--------|
| Low  | 1.667              | 266.72                 | 31.60              | 400.00        | PASS   |
| Mid  | 1.667              | 266.72                 | 31.60              |               | PASS   |
| High | 1.667              | 266.72                 | 31.60              |               | PASS   |

**DH 5**CH Low:  $2.933 * (1600/6)/79 * 31.6 = 312.85$  (ms)CH Mid:  $2.900 * (1600/6)/79 * 31.6 = 309.33$  (ms)CH High:  $2.900 * (1600/6)/79 * 31.6 = 309.33$  (ms)

| CH   | Pulse Time<br>(ms) | Total of Dwell<br>(ms) | Period Time<br>(s) | Limit<br>(ms) | Result |
|------|--------------------|------------------------|--------------------|---------------|--------|
| Low  | 2.933              | 312.85                 | 31.60              | 400.00        | PASS   |
| Mid  | 2.900              | 309.33                 | 31.60              |               | PASS   |
| High | 2.900              | 309.33                 | 31.60              |               | PASS   |



## For 8DPSK

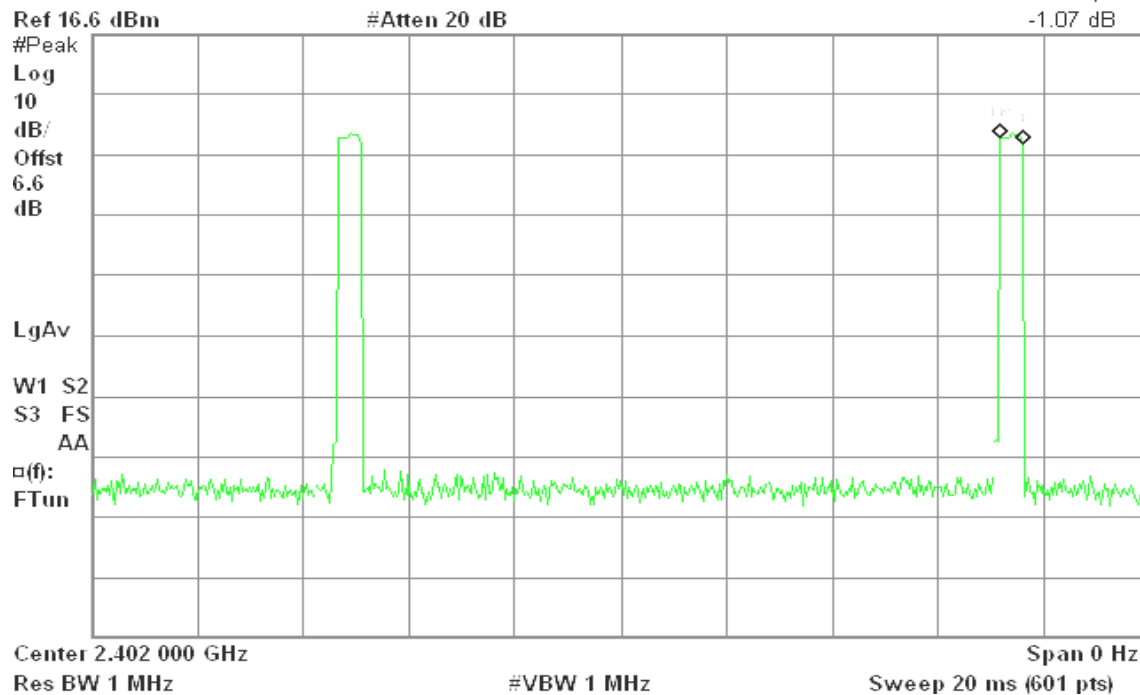
### DH 1

#### CH Low

Agilent 10:41:05 Oct 6, 2009

R T

Δ Mkr1 433.3 μs  
-1.07 dB

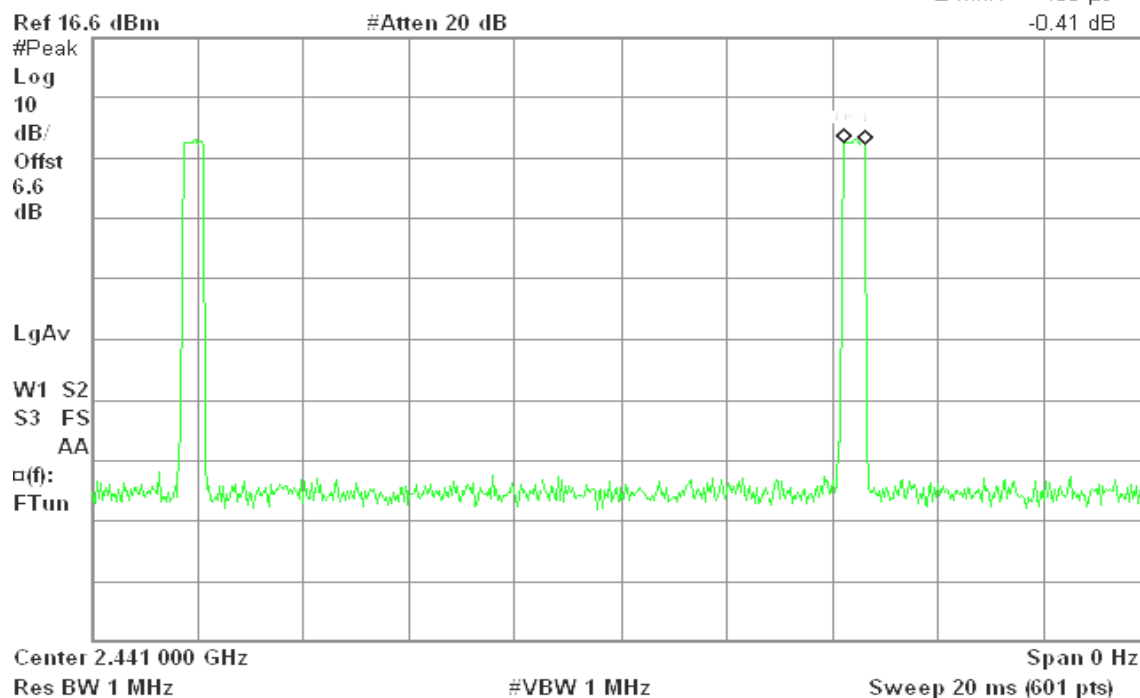


#### CH Mid

Agilent 10:41:47 Oct 6, 2009

R T

Δ Mkr1 400 μs  
-0.41 dB



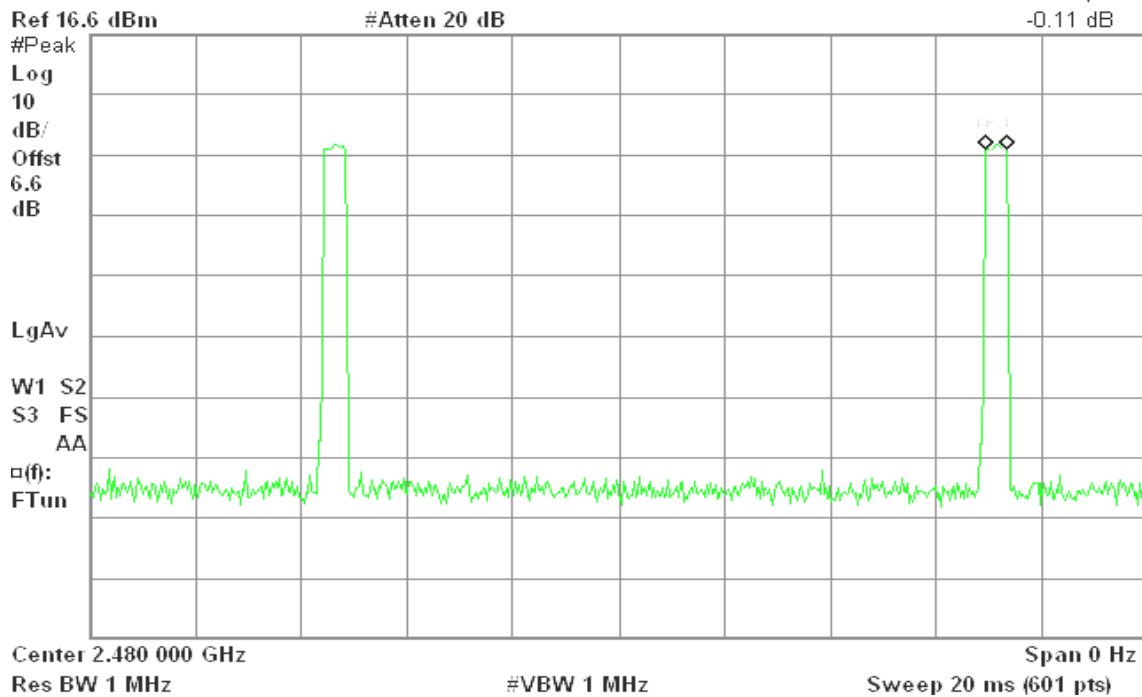


## CH High

Agilent 10:44:20 Oct 6, 2009

R T

$\Delta$  Mkr1 400  $\mu$ s  
-0.11 dB



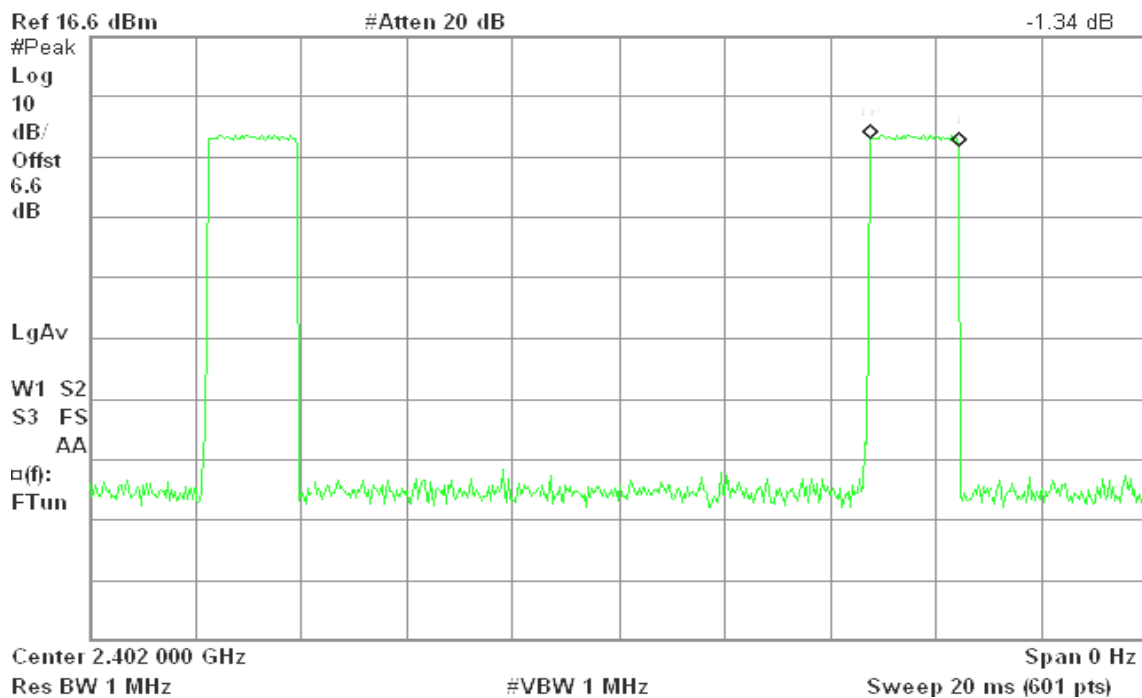
## DH 3

### CH Low

Agilent 10:40:40 Oct 6, 2009

R T

$\Delta$  Mkr1 1.667 ms  
-1.34 dB





## CH Mid

Agilent 10:42:23 Oct 6, 2009

R T

Δ Mkr1 1.667 ms  
-0.39 dB

Ref 16.6 dBm

#Atten 20 dB

#Peak

Log

10

dB/

Offst

6.6

dB

LgAv

W1 S2

S3 FS

AA

□(f):

FTun

Center 2.441 000 GHz

Res BW 1 MHz

#VBW 1 MHz

Span 0 Hz

Sweep 20 ms (601 pts)

## CH High

Agilent 10:43:56 Oct 6, 2009

R T

Δ Mkr1 1.667 ms  
2.85 dB

Ref 16.6 dBm

#Atten 20 dB

#Peak

Log

10

dB/

Offst

6.6

dB

LgAv

W1 S2

S3 FS

AA

□(f):

FTun

Center 2.480 000 GHz

Res BW 1 MHz

#VBW 1 MHz

Span 0 Hz

Sweep 20 ms (601 pts)



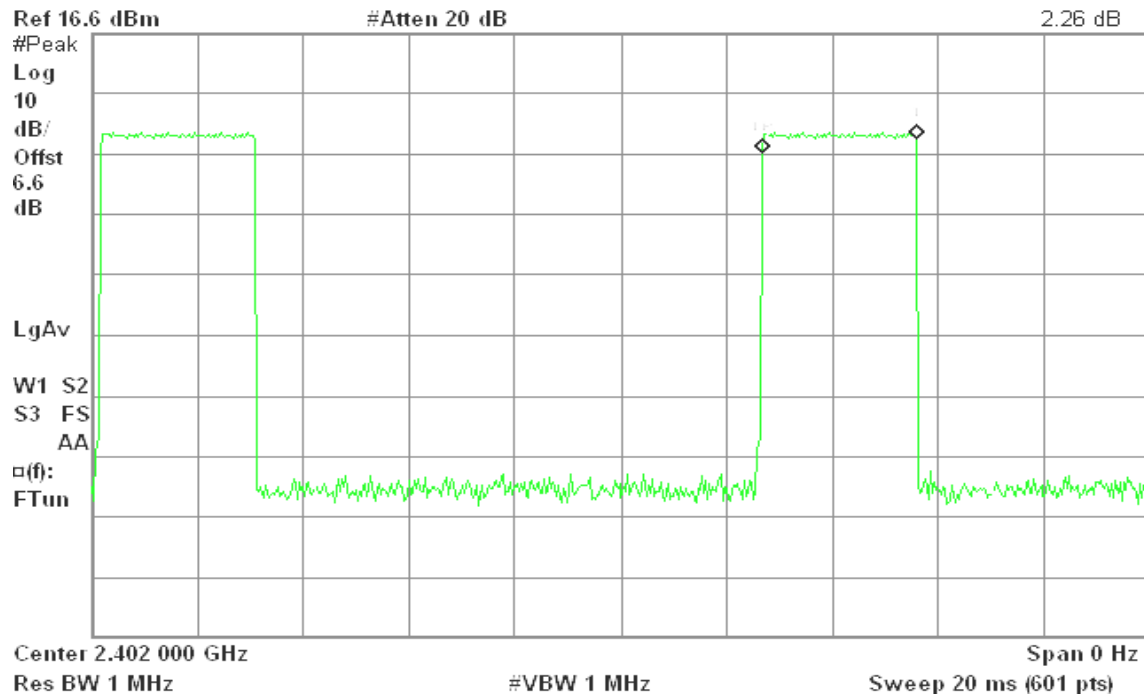
## DH 5

### CH Low

Agilent 10:39:44 Oct 6, 2009

R T

Δ Mkr1 2.933 ms  
2.26 dB

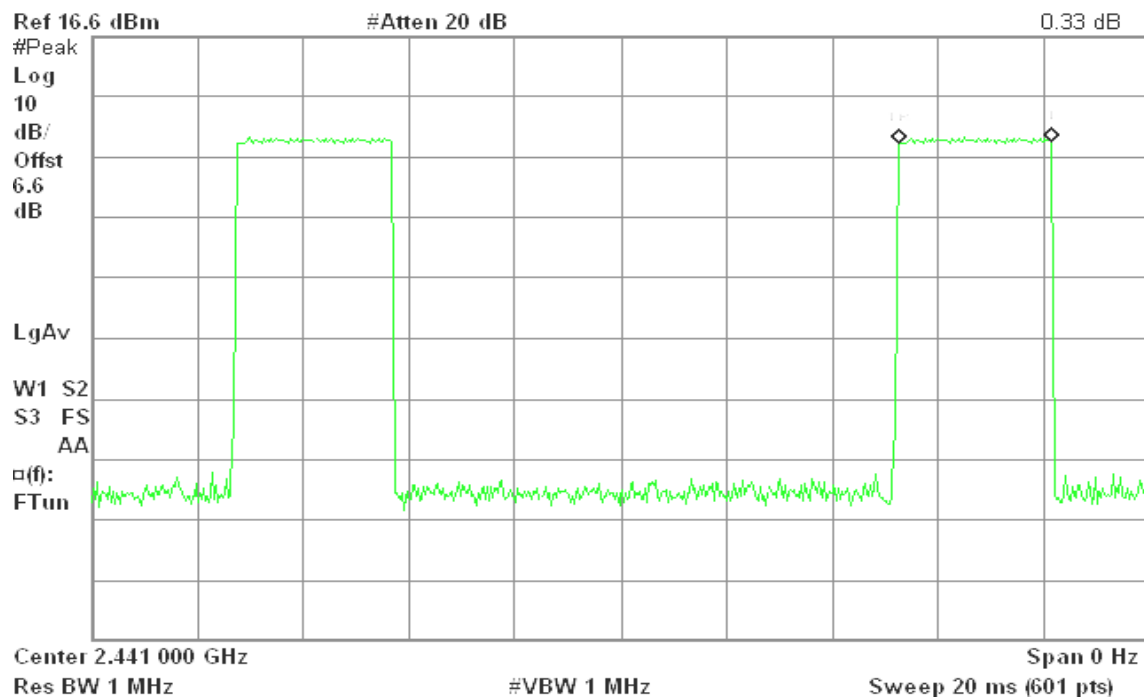


### CH Mid

Agilent 10:42:53 Oct 6, 2009

R T

Δ Mkr1 2.9 ms  
0.33 dB







## CH High

Agilent 10:43:28 Oct 6, 2009

R T

Δ Mkr1 2.9 ms  
-0.26 dB

Ref 16.6 dBm

#Atten 20 dB

#Peak

Log

10

dB/

Offst

6.6

dB

LgAv

W1 S2

S3 FS

AA

□(f):

FTun

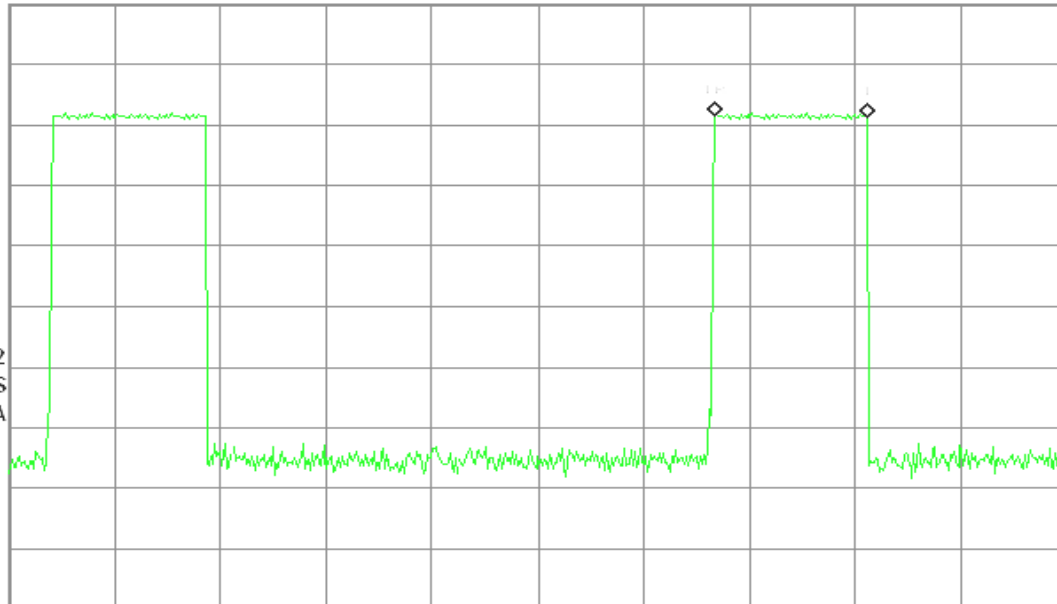
Start 2.480 000 GHz

Res BW 1 MHz

#VBW 1 MHz

Stop 2.480 000 GHz

Sweep 20 ms (601 pts)





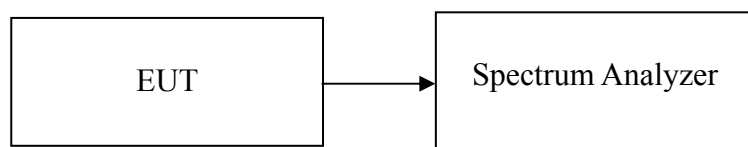
## 7.8 SPURIOUS EMISSIONS

### 7.8.1 Conducted Measurement

#### LIMIT

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 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 100 kHz.

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

#### TEST RESULTS

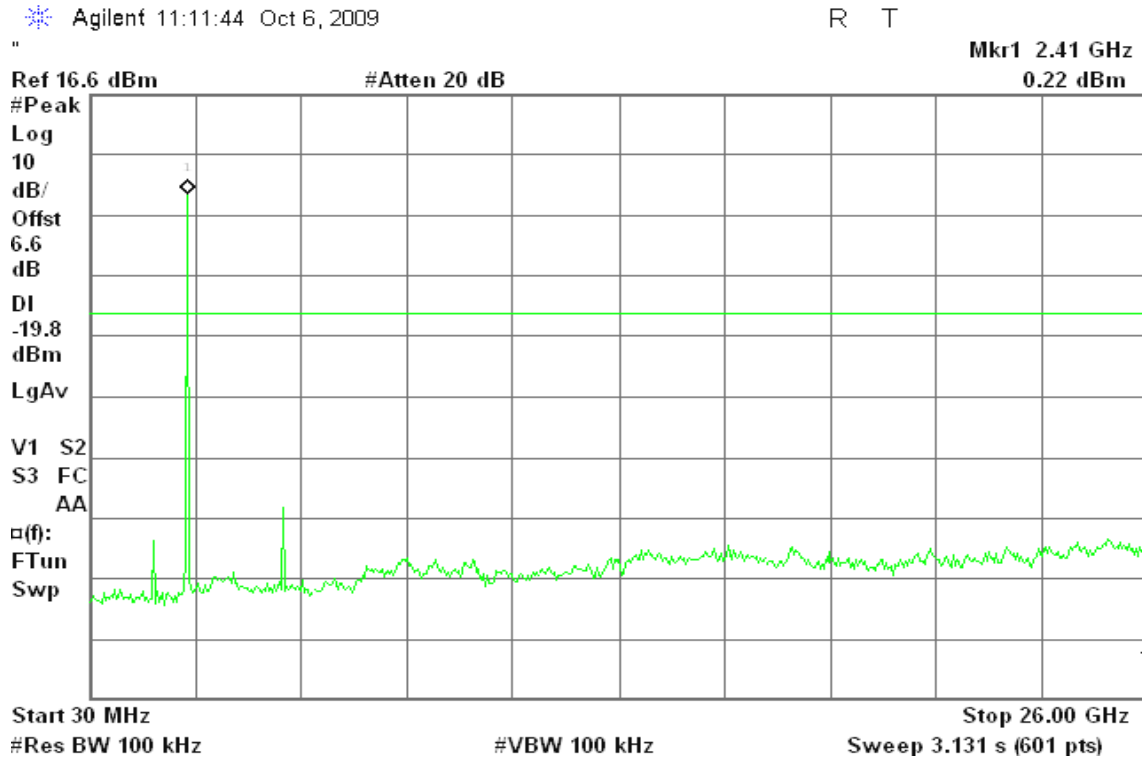
*No non-compliance noted*



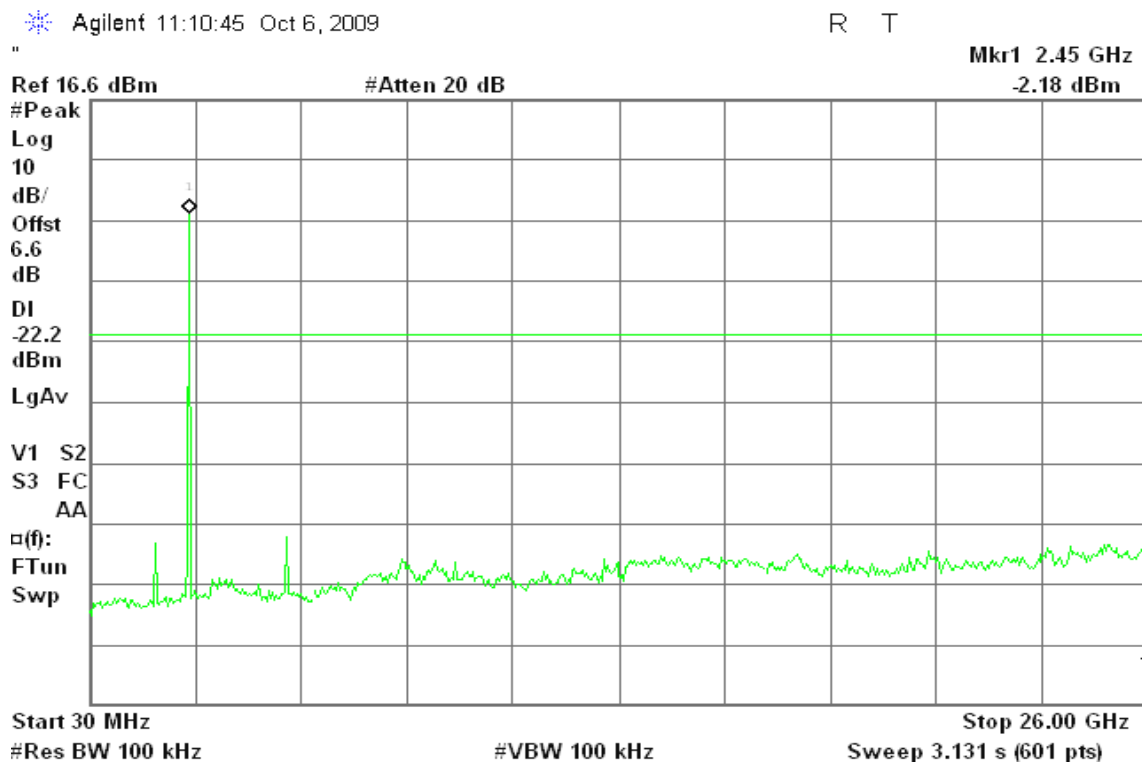
## Test Plot

### For GFSK / DH5

#### CH Low



#### CH Mid

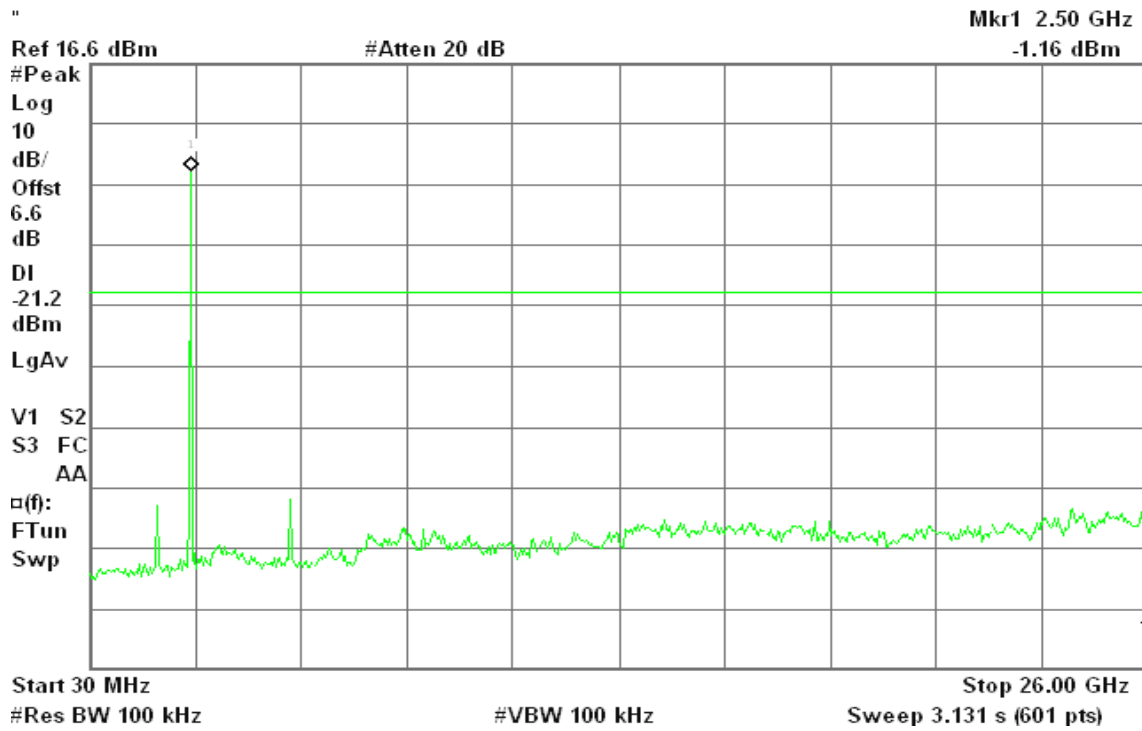




## CH High

Agilent 11:09:38 Oct 6, 2009

R T



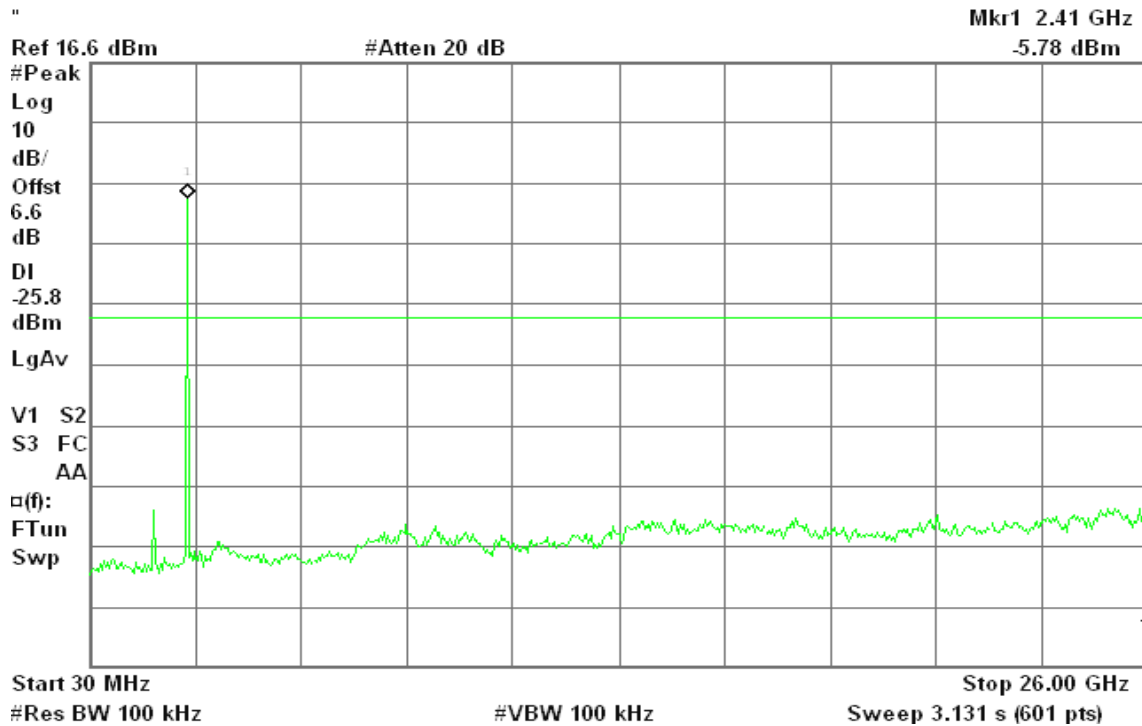


## For 8DPSK / DH5

### CH Low

Agilent 11:06:35 Oct 6, 2009

R T



### CH Mid

Agilent 11:07:31 Oct 6, 2009

R T

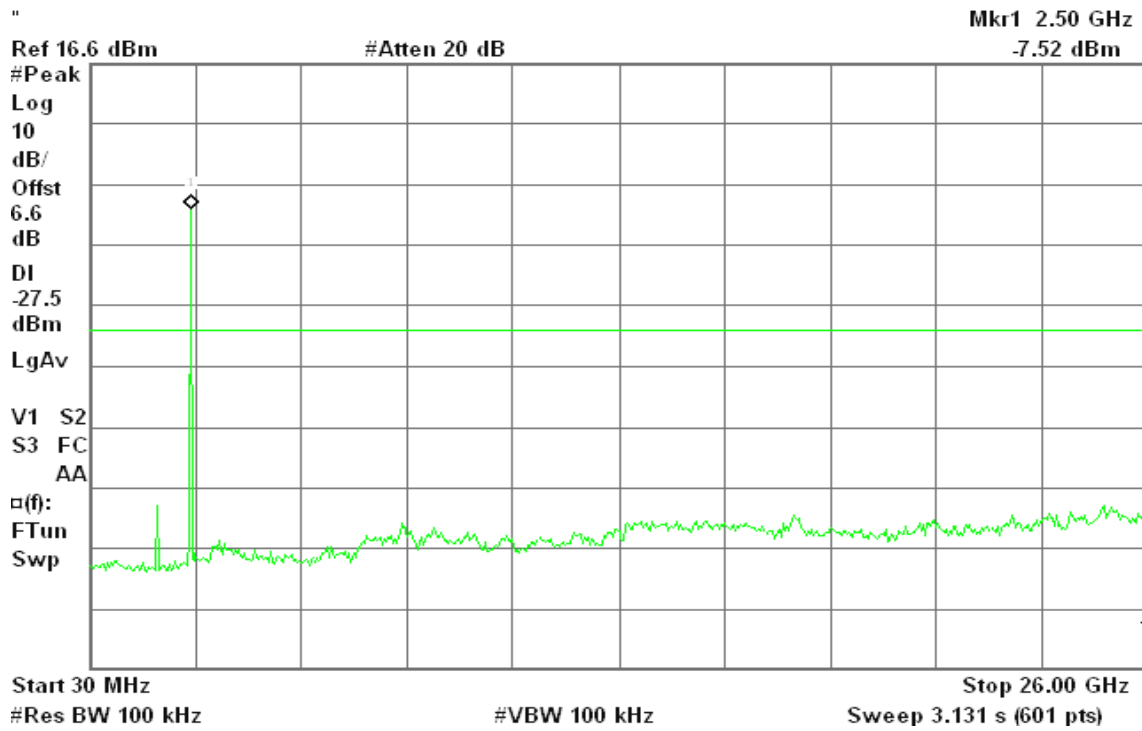




## CH High

Agilent 11:08:47 Oct 6, 2009

R T





## 7.8.2 Radiated Emissions

### LIMIT

1. According to §15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency<br>(MHz) | Field Strength<br>( $\mu\text{V/m}$ ) | Measurement Distance<br>(m) |
|--------------------|---------------------------------------|-----------------------------|
| 30-88              | 100*                                  | 3                           |
| 88-216             | 150*                                  | 3                           |
| 216-960            | 200*                                  | 3                           |
| Above 960          | 500                                   | 3                           |

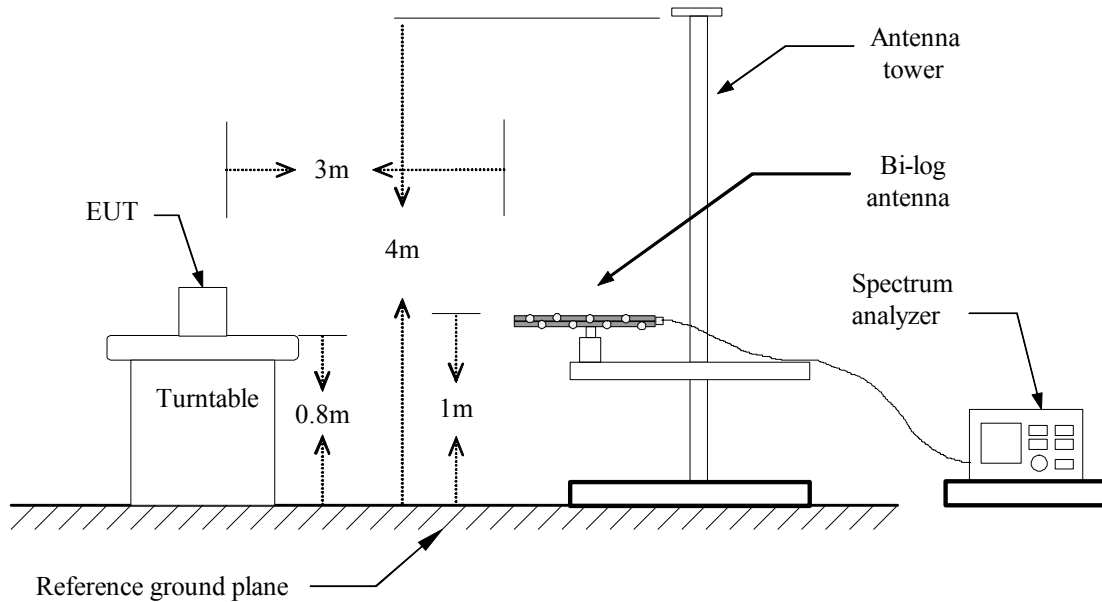
**Remark:** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

2. In the emission table above, the tighter limit applies at the band edges.

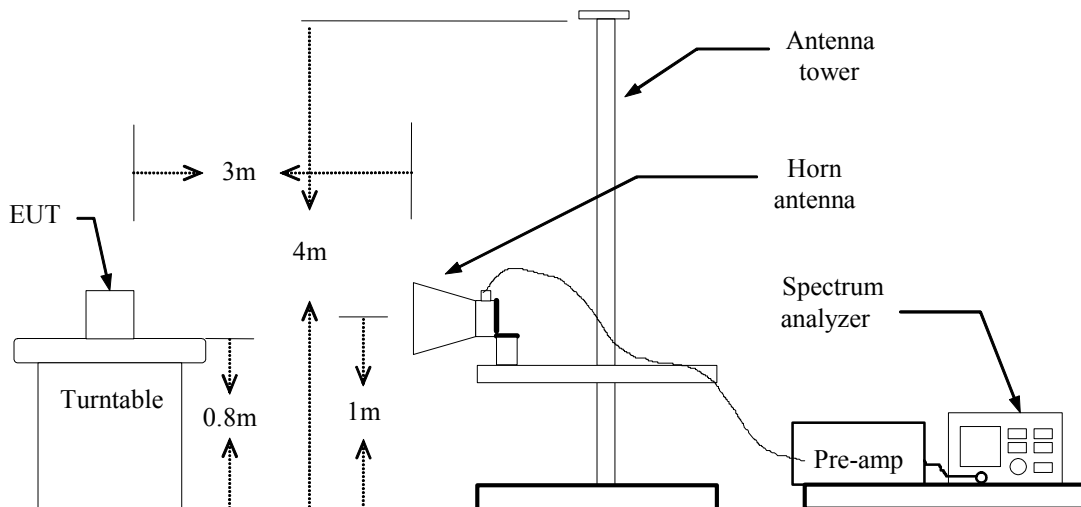
| Frequency<br>(MHz) | Field Strength<br>( $\mu\text{V/m}$ at 3-meter) | Field Strength<br>(dB $\mu\text{V/m}$ at 3-meter) |
|--------------------|---|---|
| 30-88              | 100   | 40  |
| 88-216             | 150   | 43.5  |
| 216-960            | 200   | 46  |
| Above 960          | 500   | 54  |

## **Test Configuration**

### **Below 1 GHz**



### **Above 1 GHz**







## **TEST PROCEDURE**

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m 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. Set the spectrum analyzer in the following setting as:  
Below 1GHz:  
RBW=100kHz / VBW=300kHz / Sweep=AUTO  
Above 1GHz:  
(a) PEAK: RBW=VBW=1MHz / Sweep=AUTO  
(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
7. Repeat above procedures until the measurements for all frequencies are complete.

**Below 1 GHz****Operation Mode:** Normal Link**Test Date:** October 2, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53 % RH**Polarity:** Ver. / Hor.

| Frequency (MHz) | Ant.Pol. (H/V) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|----------------|--------------------------|-----------------|----------------|-------------|--------|
| 36.47           | V              | 39.58          | -6.46                    | 33.12           | 40.00          | -6.88       | Peak   |
| 47.78           | V              | 46.40          | -13.74                   | 32.66           | 40.00          | -7.34       | Peak   |
| 89.82           | V              | 48.44          | -15.31                   | 33.12           | 43.50          | -10.38      | Peak   |
| 101.13          | V              | 45.31          | -12.67                   | 32.63           | 43.50          | -10.87      | Peak   |
| 149.63          | V              | 45.05          | -9.97                    | 35.07           | 43.50          | -8.43       | Peak   |
| 160.95          | V              | 47.12          | -10.37                   | 36.75           | 43.50          | -6.75       | Peak   |
| 89.82           | H              | 49.21          | -15.31                   | 33.89           | 43.50          | -9.61       | Peak   |
| 99.52           | H              | 47.22          | -12.99                   | 34.23           | 43.50          | -9.27       | Peak   |
| 160.95          | H              | 41.63          | -10.37                   | 31.27           | 43.50          | -12.23      | Peak   |
| 181.97          | H              | 45.16          | -11.17                   | 33.99           | 43.50          | -9.51       | Peak   |
| 220.77          | H              | 45.39          | -11.09                   | 34.29           | 46.00          | -11.71      | Peak   |
| 359.80          | H              | 39.00          | -7.22                    | 31.78           | 46.00          | -14.22      | Peak   |

**Remark:**

1. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).
2. Radiated emissions measured were made with an instrument using peak/quasi-peak detector mode.
3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, 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.
5. Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).

**Above 1 GHz****Operation Mode:** TX / GFSK / DH5 / CH Low**Test Date:** October 2, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53 % RH**Polarity:** Ver. / Hor.

| Frequency (MHz) | Ant.Pol. (H/V) | Reading (Peak) (dBuV) | Reading (Average) (dBuV) | Correction Factor (dB/m) | Result (Peak) (dBuV/m) | Result (Average) (dBuV/m) | Limit (Peak) (dBuV/m) | Limit (Average) (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|--------------------------|--------------------------|------------------------|---------------------------|-----------------------|--------------------------|-------------|--------|
| 1333.33         | V              | 56.01                 | ---                      | -7.34                    | 48.67                  | ---                       | 74.00                 | 54.00                    | -5.33       | Peak   |
| 4808.33         | V              | 57.62                 | 41.62                    | 1.04                     | 58.66                  | 42.66                     | 74.00                 | 54.00                    | -11.34      | AVG    |
| N/A             |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
| 1600.00         | H              | 57.67                 | ---                      | -6.07                    | 51.60                  | ---                       | 74.00                 | 54.00                    | -2.40       | Peak   |
| 4800.00         | H              | 60.55                 | 42.96                    | 1.04                     | 61.59                  | 44.00                     | 74.00                 | 54.00                    | -10.00      | AVG    |
| N/A             |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Operation Mode:** TX / GFSK / DH5 / CH Mid**Test Date:** October 2, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53 % RH**Polarity:** Ver. / Hor.

| Frequency (MHz) | Ant.Pol. (H/V) | Reading (Peak) (dBuV) | Reading (Average) (dBuV) | Correction Factor (dB/m) | Result (Peak) (dBuV/m) | Result (Average) (dBuV/m) | Limit (Peak) (dBuV/m) | Limit (Average) (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|--------------------------|--------------------------|------------------------|---------------------------|-----------------------|--------------------------|-------------|--------|
| 1330.00         | V              | 56.60                 | ---                      | -7.35                    | 49.26                  | ---                       | 74.00                 | 54.00                    | -4.74       | Peak   |
| 4883.33         | V              | 59.06                 | 41.95                    | 1.02                     | 60.08                  | 42.97                     | 74.00                 | 54.00                    | -11.03      | AVG    |
| N/A             |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
| 1626.67         | H              | 60.29                 | 54.15                    | -5.82                    | 54.47                  | 48.33                     | 74.00                 | 54.00                    | -5.67       | AVG    |
| 4883.33         | H              | 62.20                 | 43.38                    | 1.02                     | 63.22                  | 44.40                     | 74.00                 | 54.00                    | -9.60       | AVG    |
| N/A             |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser; with " N/A " remark, 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.
6.  $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$ .

**Operation Mode:** TX / GFSK / DH5 / CH High**Test Date:** October 2, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53 % RH**Polarity:** Ver. / Hor.

| Frequency (MHz) | Ant.Pol. (H/V) | Reading (Peak) (dBuV) | Reading (Average) (dBuV) | Correction Factor (dB/m) | Result (Peak) (dBuV/m) | Result (Average) (dBuV/m) | Limit (Peak) (dBuV/m) | Limit (Average) (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|--------------------------|--------------------------|------------------------|---------------------------|-----------------------|--------------------------|-------------|--------|
| 1330.00         | V              | 56.60                 | ---                      | -7.35                    | 49.26                  | ---                       | 74.00                 | 54.00                    | -4.74       | Peak   |
| 4958.33         | V              | 57.58                 | 41.46                    | 1.00                     | 58.58                  | 42.46                     | 74.00                 | 54.00                    | -11.54      | AVG    |
| N/A             |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
| 1653.33         | H              | 57.11                 | ---                      | -5.56                    | 51.54                  | ---                       | 74.00                 | 54.00                    | -2.46       | Peak   |
| 4958.33         | H              | 58.85                 | 42.16                    | 1.00                     | 59.85                  | 43.16                     | 74.00                 | 54.00                    | -10.84      | AVG    |
| N/A             |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser; with " N/A " remark, 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.
6.  $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$ .

**Operation Mode:** TX / 8DPSK / DH5 / CH Low**Test Date:** October 2, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53 % RH**Polarity:** Ver. / Hor.

| Frequency (MHz) | Ant.Pol. (H/V) | Reading (Peak) (dBuV) | Reading (Average) (dBuV) | Correction Factor (dB/m) | Result (Peak) (dBuV/m) | Result (Average) (dBuV/m) | Limit (Peak) (dBuV/m) | Limit (Average) (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|--------------------------|--------------------------|------------------------|---------------------------|-----------------------|--------------------------|-------------|--------|
| 1330.00         | V              | 56.54                 | ---                      | -7.35                    | 49.19                  | ---                       | 74.00                 | 54.00                    | -4.81       | Peak   |
| N/A             |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
| 1603.33         | H              | 60.77                 | 53.86                    | -6.04                    | 54.73                  | 47.82                     | 74.00                 | 54.00                    | -6.18       | AVG    |
| N/A             |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser; with " N/A " remark, 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.
6.  $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$ .

**Operation Mode:** TX / 8DPSK / DH5 / CH Mid**Test Date:** October 2, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53 % RH**Polarity:** Ver. / Hor.

| Frequency (MHz) | Ant.Pol. (H/V) | Reading (Peak) (dBuV) | Reading (Average) (dBuV) | Correction Factor (dB/m) | Result (Peak) (dBuV/m) | Result (Average) (dBuV/m) | Limit (Peak) (dBuV/m) | Limit (Average) (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|--------------------------|--------------------------|------------------------|---------------------------|-----------------------|--------------------------|-------------|--------|
| 1333.33         | V              | 57.04                 | ---                      | -7.34                    | 49.70                  | ---                       | 74.00                 | 54.00                    | -4.30       | Peak   |
| N/A             |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
| 1630.00         | H              | 57.35                 | ---                      | -5.79                    | 51.56                  | ---                       | 74.00                 | 54.00                    | -2.44       | Peak   |
| N/A             |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser; with " N/A " remark, 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Operation Mode:** TX / 8DPSK / DH5 / CH High**Test Date:** October 2, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53 % RH**Polarity:** Ver. / Hor.

| Frequency (MHz) | Ant.Pol. (H/V) | Reading (Peak) (dBuV) | Reading (Average) (dBuV) | Correction Factor (dB/m) | Result (Peak) (dBuV/m) | Result (Average) (dBuV/m) | Limit (Peak) (dBuV/m) | Limit (Average) (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|--------------------------|--------------------------|------------------------|---------------------------|-----------------------|--------------------------|-------------|--------|
| 1256.67         | V              | 55.36                 | ---                      | -7.48                    | 47.88                  | ---                       | 74.00                 | 54.00                    | -6.12       | Peak   |
| N/A             |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
| 1653.33         | H              | 59.77                 | 53.16                    | -5.56                    | 54.21                  | 47.60                     | 74.00                 | 54.00                    | -6.40       | AVG    |
| N/A             |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |
|                 |                |                       |                          |                          |                        |                           |                       |                          |             |        |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser; with " N/A " remark, 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.
6.  $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$ .





## 7.9 POWERLINE CONDUCTED EMISSIONS

### LIMIT

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that 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 the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

| Frequency Range<br>(MHz) | Limits<br>(dB $\mu$ V) |           |
|--------------------------|------------------------|-----------|
|                          | 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        |

\* Decreases with the logarithm of the frequency.

### Test Configuration

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

### TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

### TEST RESULTS

Not applicable, because the EUT does not connect to the AC main source.

*Not applicable, because the EUT is not connected to the AC main source.*



## APPENDIX I

### RADIO FREQUENCY EXPOSURE

#### LIMIT

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

#### EUT Specification

| EUT                        | Handy Wireless CCD Barcode Scanner  |
|----------------------------|---|
| Frequency band (Operating) | <input type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz<br><input type="checkbox"/> WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz<br><input type="checkbox"/> WLAN: 5.745GHz ~ 5.825GHz<br><input checked="" type="checkbox"/> Others: <u>Bluetooth: 2.402GHz ~ 2.480GHz</u> |
| Device category            | <input checked="" type="checkbox"/> Portable (<20cm separation)<br><input type="checkbox"/> Mobile (>20cm separation)<br><input type="checkbox"/> Others _____  |
| Exposure classification    | <input type="checkbox"/> Occupational/Controlled exposure ( $S = 5mW/cm^2$ )<br><input checked="" type="checkbox"/> General Population/Uncontrolled exposure ( $S = 1mW/cm^2$ )   |
| Antenna diversity          | <input checked="" type="checkbox"/> Single antenna<br><input type="checkbox"/> Multiple antennas<br><input type="checkbox"/> Tx diversity<br><input type="checkbox"/> Rx diversity<br><input type="checkbox"/> Tx/Rx diversity  |
| Max. output power          | 0.97dBm (0.00125mW)   |
| Antenna gain (Max)         | 2 dBi (Numeric gain: 1.58)  |
| Evaluation applied         | <input type="checkbox"/> MPE Evaluation<br><input type="checkbox"/> SAR Evaluation<br><input checked="" type="checkbox"/> N/A*  |

#### **Remark:**

1. The maximum output power is 0.97dBm (0.00125mW) at 2402MHz (with 1.58 numeric antenna gain.)
2. DTS device is not subject to routine RF evaluation; MPE estimate is used to justify the compliance.
3. For mobile or fixed location transmitters, no SAR consideration applied. The maximum power density is  $1.0 mW/cm^2$  even if the calculation indicates that the power density would be larger.

#### TEST RESULTS

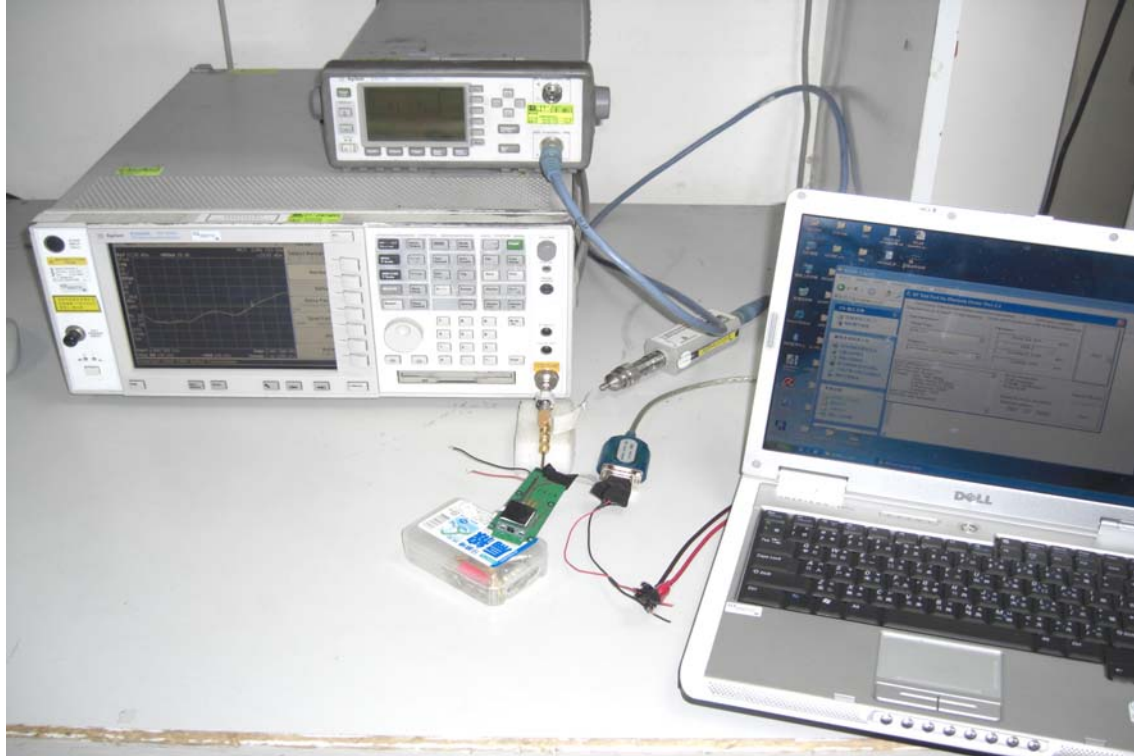
No non-compliance noted.

(SAR evaluation is not required for the PORTABLE device while its maximum output power is lower than the general population low threshold:  $60/f_{(GHz)} = 60/2.441 = 24.58mW$ )

## **APPENDIX II**

### **PHOTOGRAPHS OF TEST SETUP**

#### **CONDUCTED EMISSION SETUP PHOTO**





## **RADIATED EMISSION SETUP PHOTOS**

