

## 6. Band Edge

### 6.1. Test Equipment

The following test equipments are used during the band edge tests:

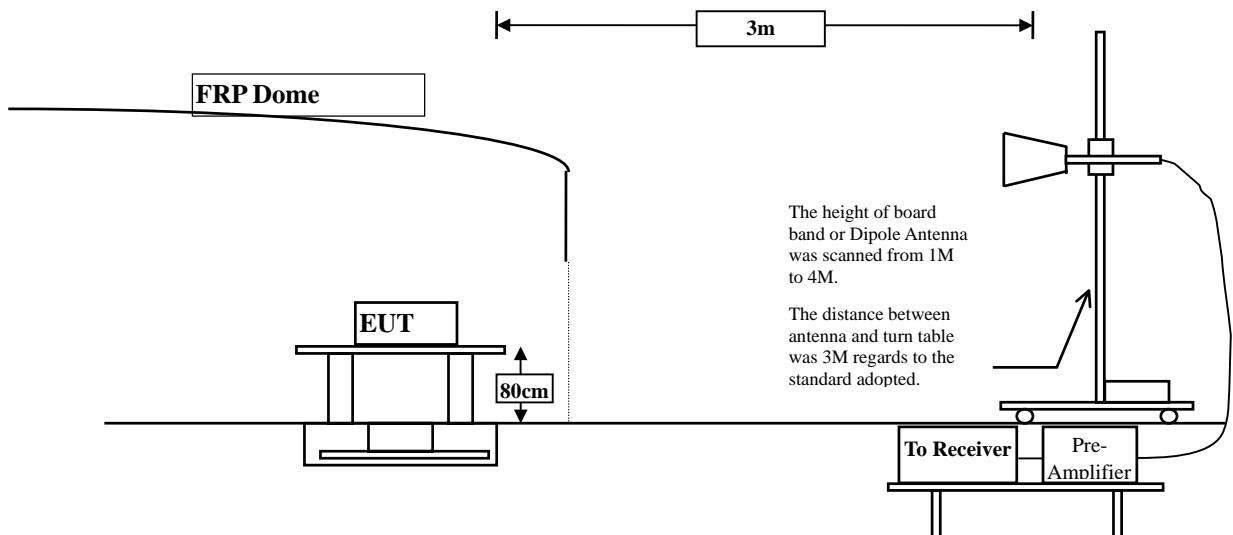
Test Site	Equipment		Manufacturer	Model No./Serial No.	Last Cal.
☒ Site # 3	X	Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2009
	X	Pre-Amplifier	HP	8447D/2944A09549	Sep., 2009
	X	Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2009
	X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2009
	X	Coaxial Cable	QuieTek	QTK-CABLE/ CAB5	Feb., 2009
	X	Controller	QuieTek	QTK-CONTROLLER/ CTRL3	N/A
	X	Coaxial Switch	Anritsu	MP59B/6200265729	N/A

Note: 1. All equipments are calibrated every one year.  
2. The test instruments marked by “X” are used to measure the final test results.

### 6.2. Test Setup

#### RF Radiated Measurement:

Above 1GHz



### **6.3. Limit**

In any 100 kHz bandwidth outside the frequency band 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. 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)).

### **6.4. Test Procedure**

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4:2003 on radiated measurement.

The bandwidth below 1GHz setting on the field strength meter is 120 kHz, above 1GHz are 1 MHz. The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

### **6.5. Uncertainty**

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

## 6.6. Test Result of Band Edge

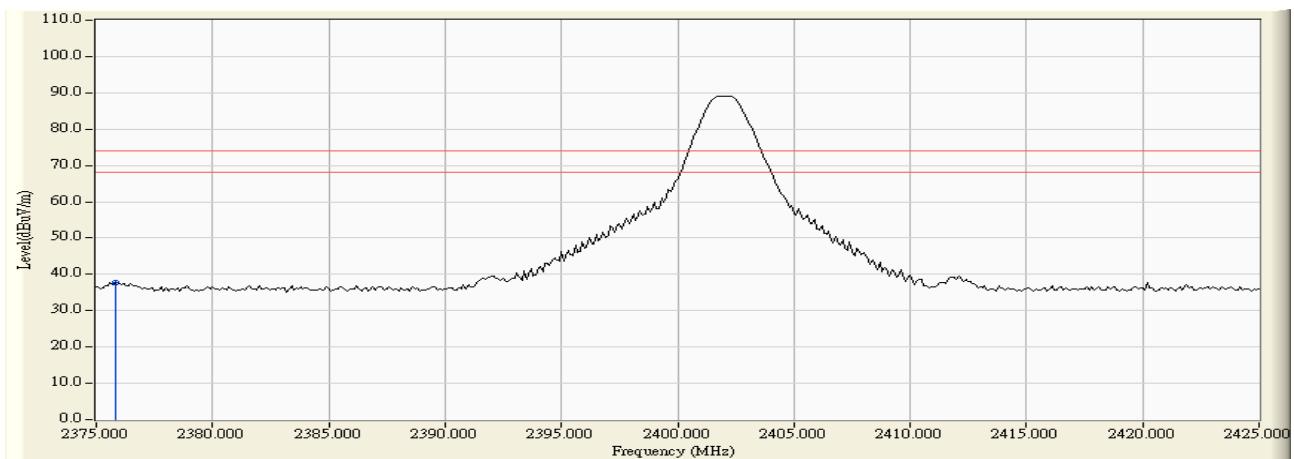
Product : Personal Navigation Device  
Test Item : Band Edge  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmitter - 1Mbps (GFSK)

### RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
00 (Peak)	2375.800	-2.444	40.337	37.893	74.00	54.00	Pass

Figure Channel 00:

Horizontal (Peak)

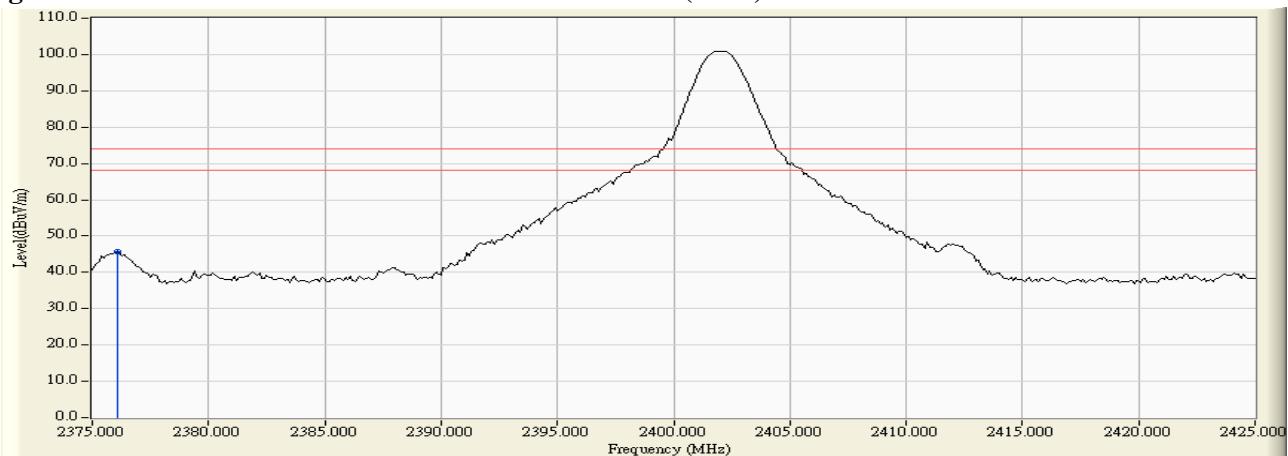


Note: RBW=1MHz, VBW=1MHz, Sweep=500ms

Product : Personal Navigation Device  
Test Item : Band Edge  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmitter - 1Mbps (GFSK)

**RF Radiated Measurement (Vertical):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
00 (Peak)	2376.100	-2.442	48.061	45.618	74.00	54.00	Pass

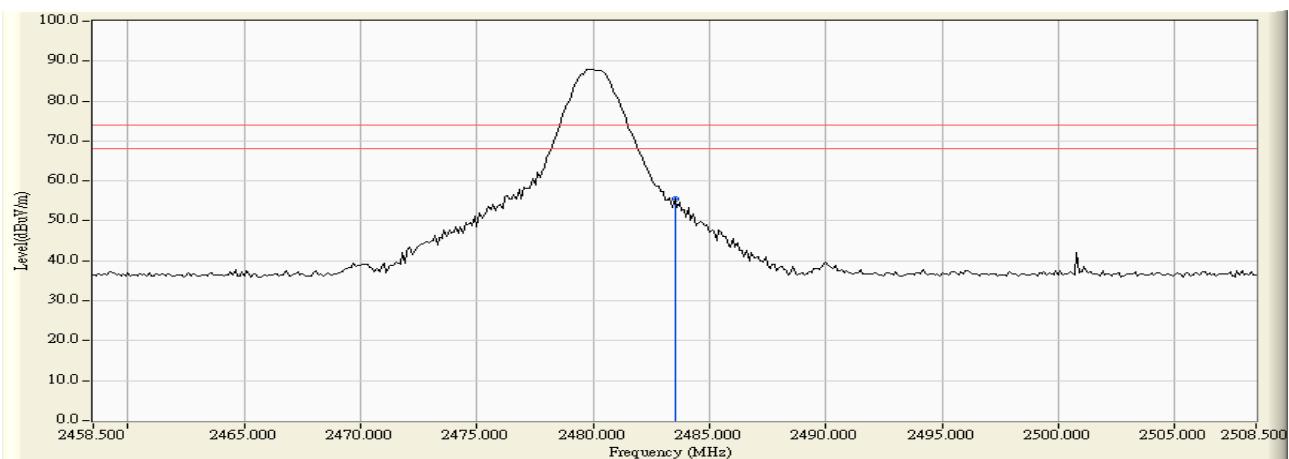
**Figure Channel 00:****Vertical (Peak)**

Note: RBW=1MHz, VBW=1MHz, Sweep=500ms

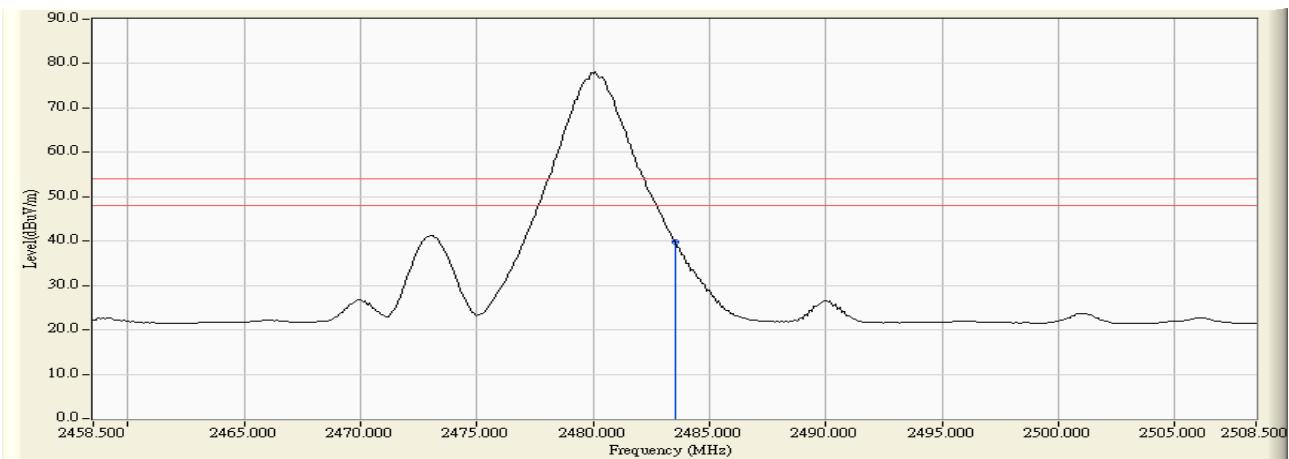
Product : Personal Navigation Device  
 Test Item : Band Edge  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter - 1Mbps (GFSK)

**RF Radiated Measurement (Horizontal):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
78 (Peak)	2483.500	-1.937	57.560	55.623	74.00	54.00	Pass
78 (Average)	2483.500	-1.937	41.811	39.874	74.00	54.00	Pass

**Figure Channel 78:**
**Horizontal (Peak)**


Note: RBW=1MHz, VBW=1MHz, Sweep=500ms

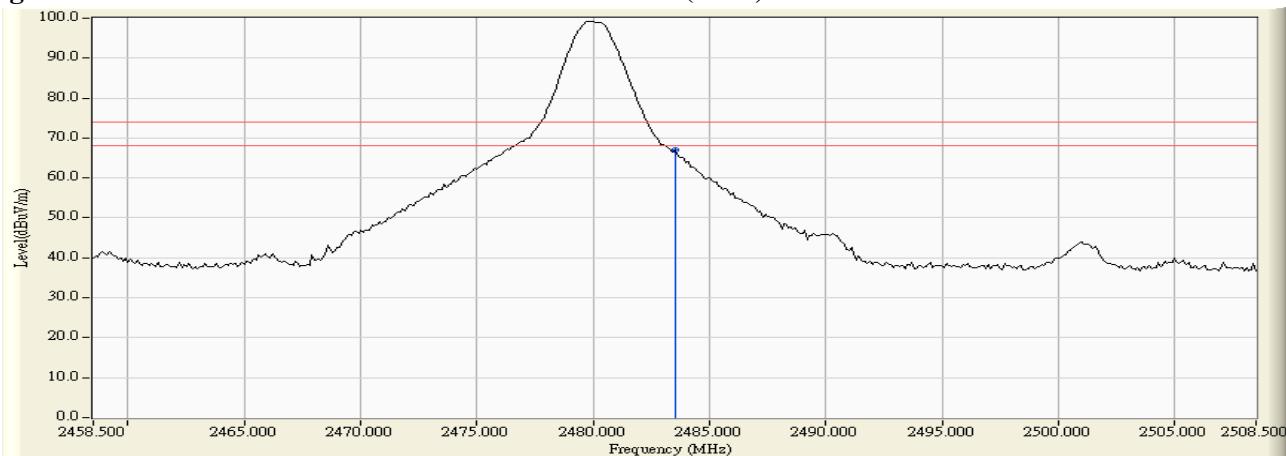
**Figure Channel 78:**
**Horizontal (Average)**


Note: RBW=1MHz, VBW=10Hz, Sweep=5s

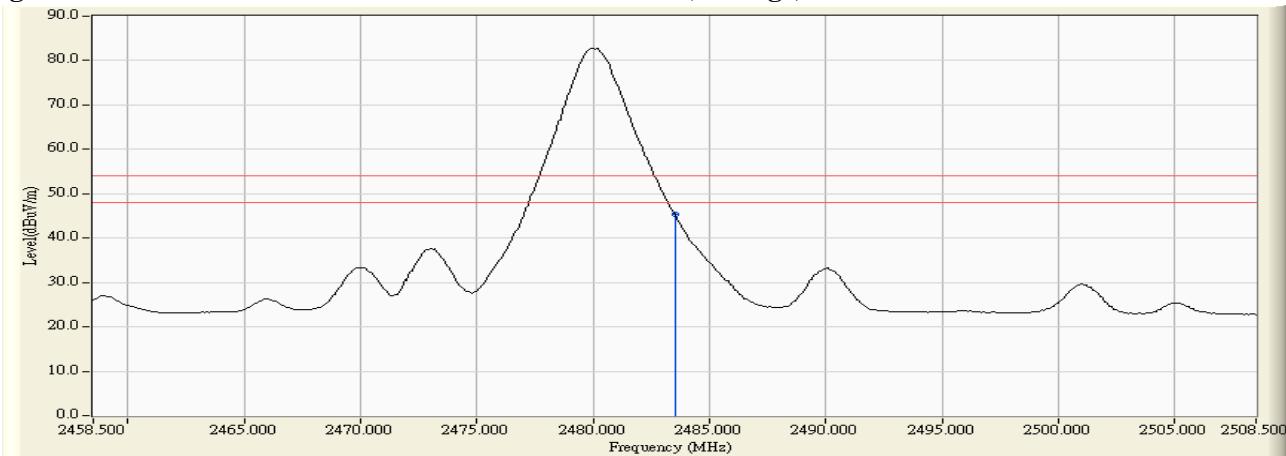
Product : Personal Navigation Device  
 Test Item : Band Edge  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter - 1Mbps (GFSK)

**RF Radiated Measurement (Vertical):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
78 (Peak)	2483.500	-1.937	68.911	66.974	74.00	54.00	Pass
78 (Average)	2483.500	-1.937	47.239	45.302	74.00	54.00	Pass

**Figure Channel 78:**
**Vertical (Peak)**


Note: RBW=1MHz, VBW=1MHz, Sweep=500ms

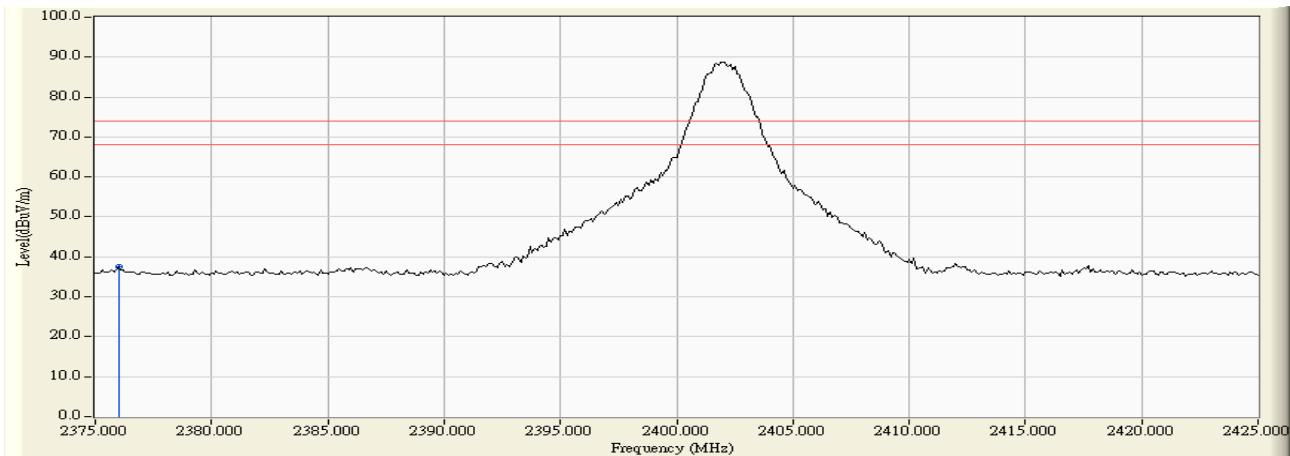
**Figure Channel 78:**
**Vertical (Average)**


Note: RBW=1MHz, VBW=10Hz, Sweep=5s

Product : Personal Navigation Device  
Test Item : Band Edge  
Test Site : No.3 OATS  
Test Mode : Mode 2: Transmitter - 3Mbps (8DPSK)

**RF Radiated Measurement (Horizontal):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
00 (Peak)	2376.000	-2.442	39.900	37.457	74.00	54.00	Pass

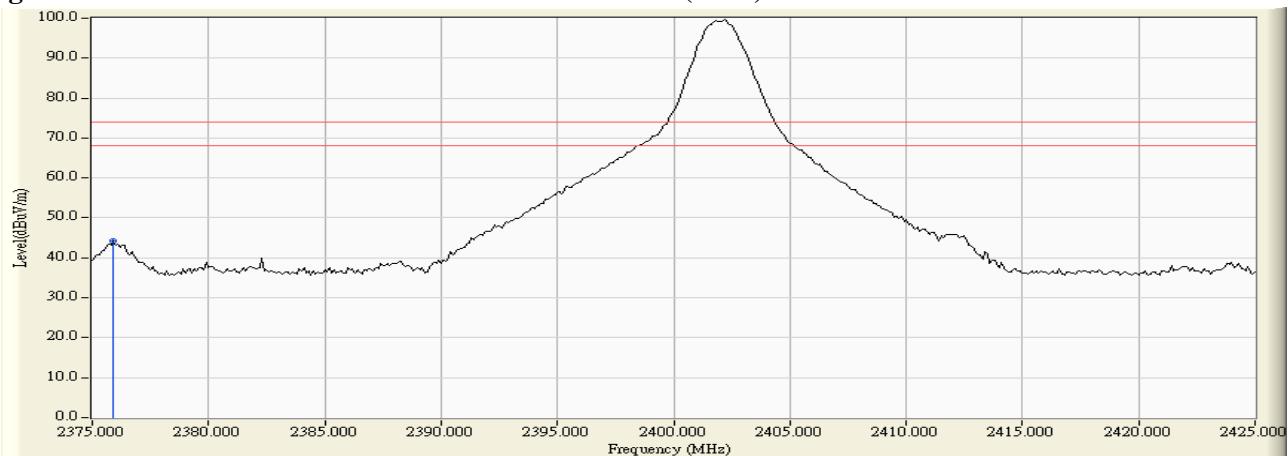
**Figure Channel 00:****Horizontal (Peak)**

Note: RBW=1MHz, VBW=1MHz, Sweep=500ms

Product : Personal Navigation Device  
Test Item : Band Edge  
Test Site : No.3 OATS  
Test Mode : Mode 2: Transmitter - 3Mbps (8DPSK)

**RF Radiated Measurement (Vertical):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
00 (Peak)	2375.900	-2.444	46.638	44.195	74.00	54.00	Pass

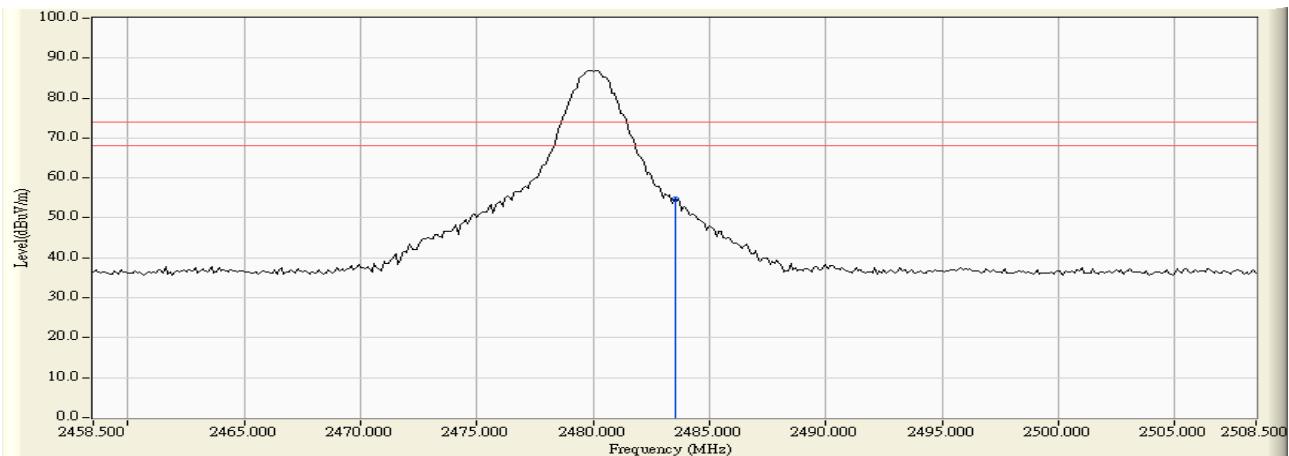
**Figure Channel 00:****Vertical (Peak)**

Note: RBW=1MHz, VBW=1MHz, Sweep=500ms

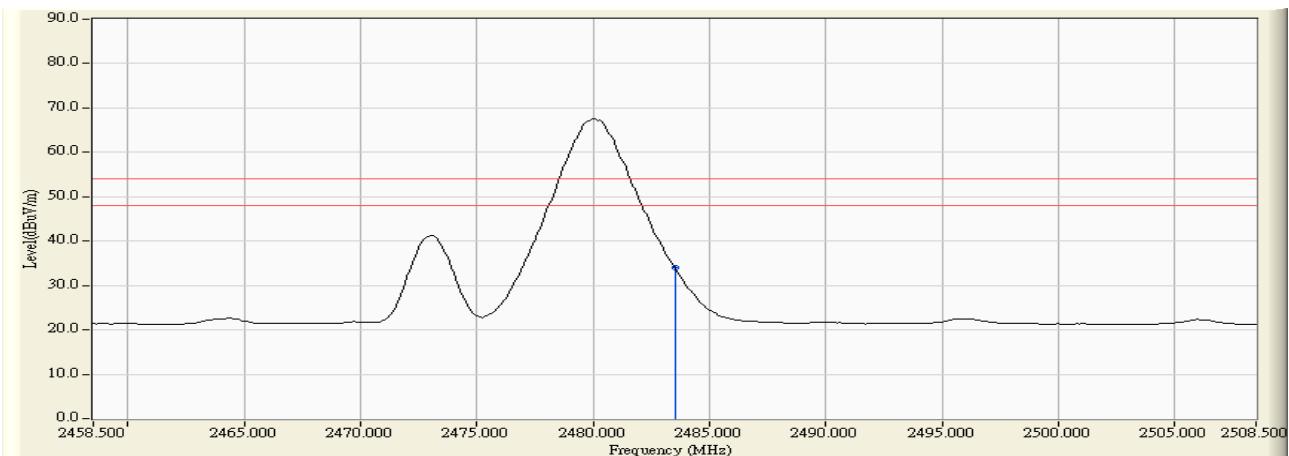
Product : Personal Navigation Device  
 Test Item : Band Edge  
 Test Site : No.3 OATS  
 Test Mode : Mode 2: Transmitter - 3Mbps (8DPSK)

**RF Radiated Measurement (Horizontal):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
78 (Peak)	2483.500	-1.937	56.508	54.571	74.00	54.00	Pass
78 (Average)	2483.500	-1.937	35.885	33.948	74.00	54.00	Pass

**Figure Channel 78:**
**Horizontal (Peak)**


Note: RBW=1MHz, VBW=1MHz, Sweep=500ms

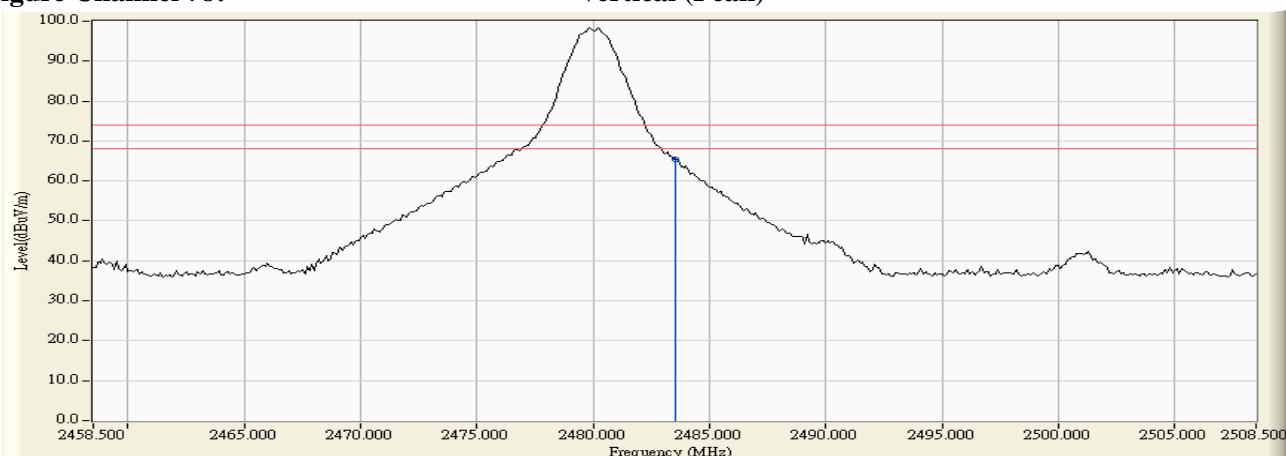
**Figure Channel 78:**
**Horizontal (Average)**


Note: RBW=1MHz, VBW=10Hz, Sweep=5s

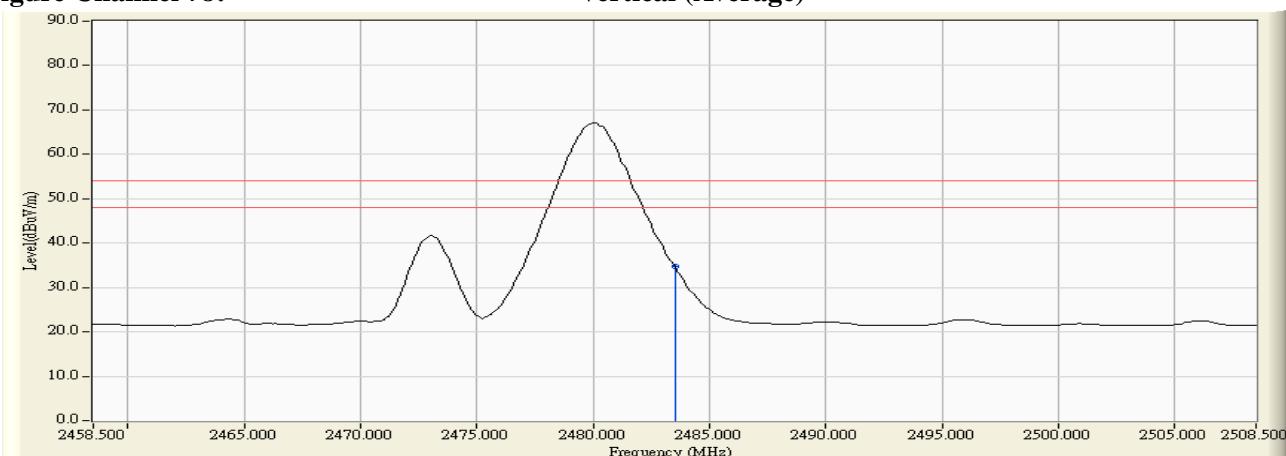
Product : Personal Navigation Device  
 Test Item : Band Edge  
 Test Site : No.3 OATS  
 Test Mode : Mode 2: Transmitter - 3Mbps (8DPSK)

**RF Radiated Measurement (Vertical):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
78 (Peak)	2483.500	-1.937	67.252	65.315	74.00	54.00	Pass
78 (Average)	2483.500	-1.937	36.619	34.682	74.00	54.00	Pass

**Figure Channel 78:**
**Vertical (Peak)**


Note: RBW=1MHz, VBW=1MHz, Sweep=500ms

**Figure Channel 78:**
**Vertical (Average)**


Note: RBW=1MHz, VBW=10Hz, Sweep=5s

## 7. Channel Number

### 7.1. Test Equipment

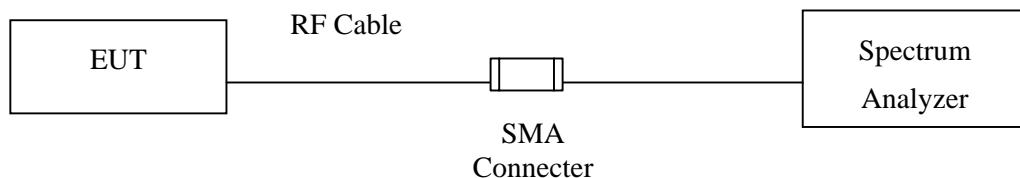
The following test equipments are used during the radiated emission tests:

Equipment	Manufacturer	Model No./Serial No.	Last Cal.	
Spectrum Analyzer	R&S	FSP40 / 100339	Jun, 2009	
Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2009	
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2009

Note: 1. All equipments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

### 7.2. Test Setup



### 7.3. Limit

Frequency hopping systems operating in the 2400-2483.5 MHz bands shall use at least 75 hopping frequencies.

### 7.4. Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

### 7.5. Uncertainty

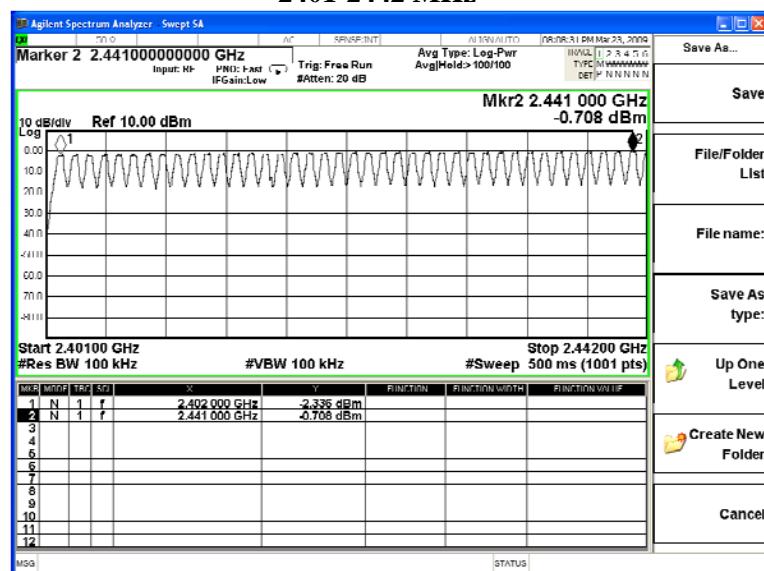
N/A

## 7.6. Test Result of Channel Number

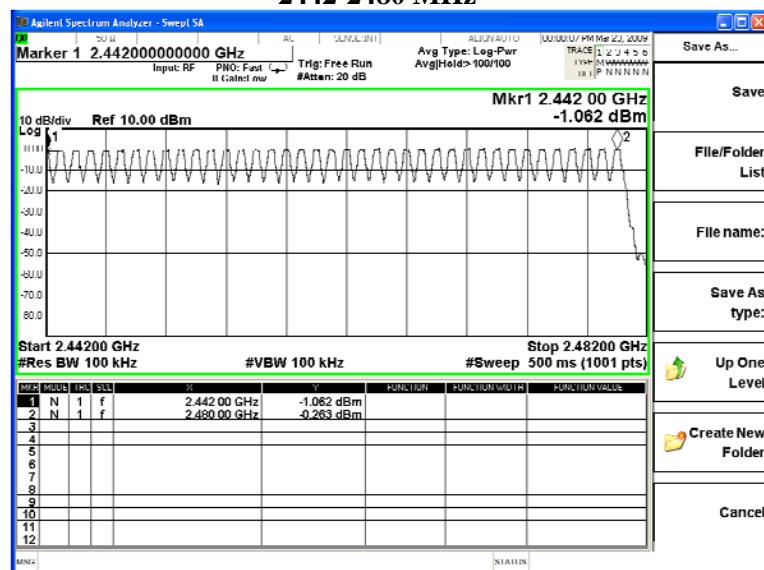
Product : Personal Navigation Device  
 Test Item : Channel Number  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter - 1Mbps (GFSK)

Frequency Range (MHz)	Measurement (Hopping Channel)	Required Limit (Hopping Channel)	Result
2402 ~ 2480	79	>75	Pass

### 2401-2442 MHz



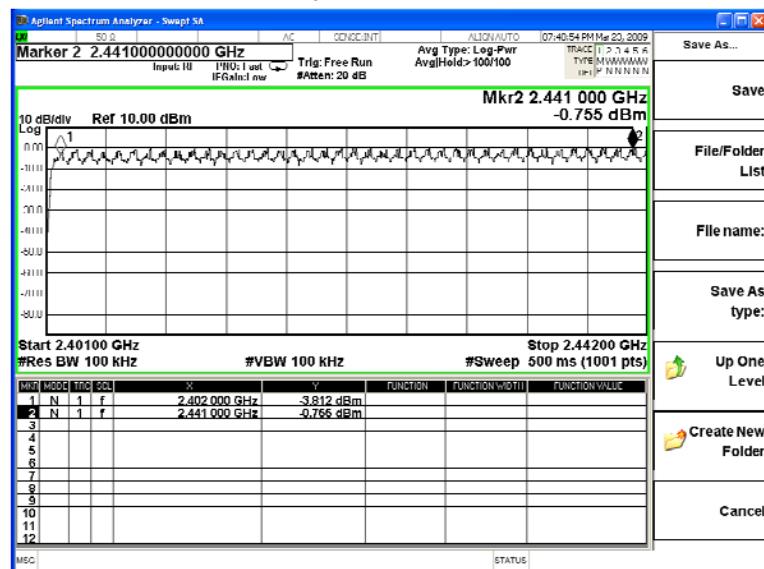
### 2442-2480 MHz



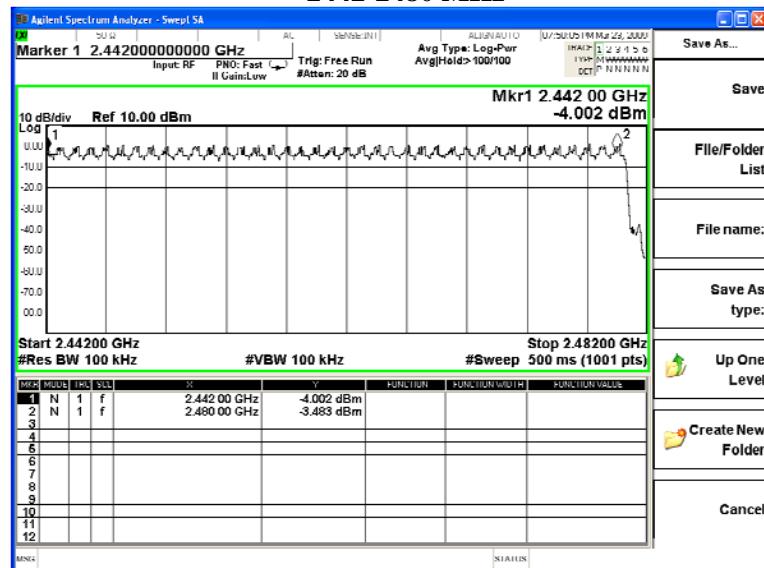
Product : Personal Navigation Device  
 Test Item : Channel Number  
 Test Site : No.3 OATS  
 Test Mode : Mode 2: Transmitter - 3Mbps (8DPSK)

Frequency Range (MHz)	Measurement (Hopping Channel)	Required Limit (Hopping Channel)	Result
2402 ~ 2480	79	>75	Pass

### 2401-2442 MHz



### 2442-2480 MHz



## 8. Channel Separation

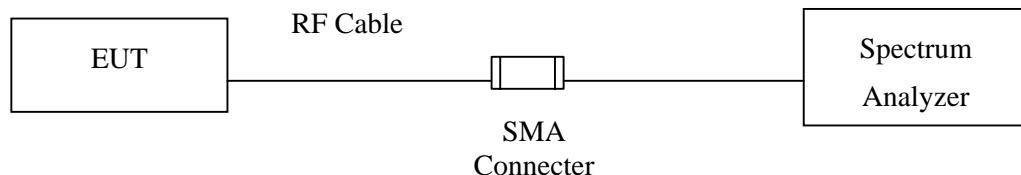
### 8.1. Test Equipment

The following test equipments are used during the radiated emission tests:

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Spectrum Analyzer	R&S	FSP40 / 100339	Jun, 2009
Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2009
X Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2009

Note: 1. All equipments are calibrated every one year.  
2. The test instruments mark by “X” are used to measure the final test results.

### 8.2. Test Setup



### 8.3. Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the  $2/3 \times (20 \text{ dB bandwidth})$  of the hopping channel, whichever is greater.

### 8.4. Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

### 8.5. Uncertainty

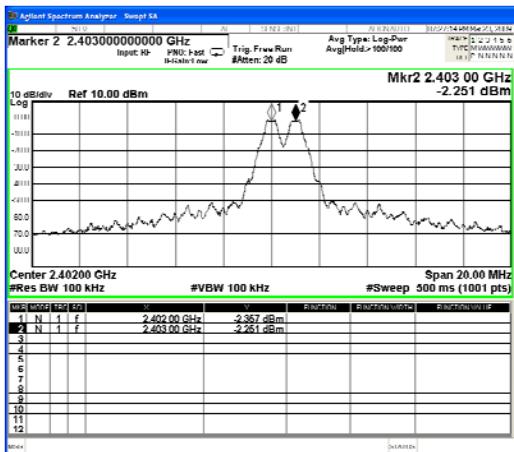
$\pm 150\text{Hz}$

## 8.6. Test Result of Channel Separation

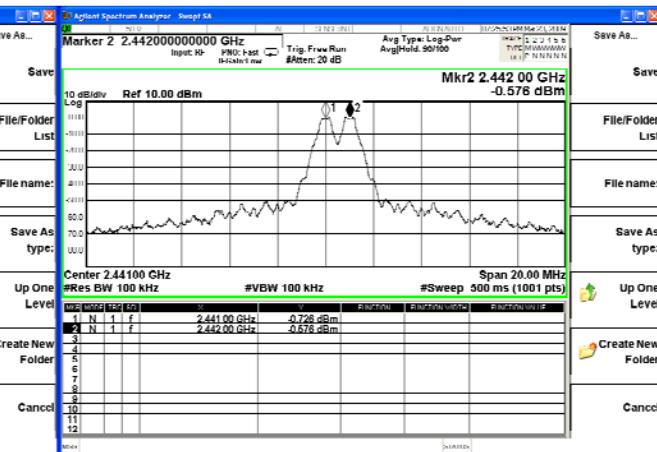
Product : Personal Navigation Device  
 Test Item : Channel Separation  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter - 1Mbps (GFSK)

Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of (2/3)*20dB Bandwidth (kHz)	Result
2402	1000	>25 kHz	807.07	Pass
2441	1000	>25 kHz	780.39	Pass
2480	1000	>25 kHz	773.72	Pass

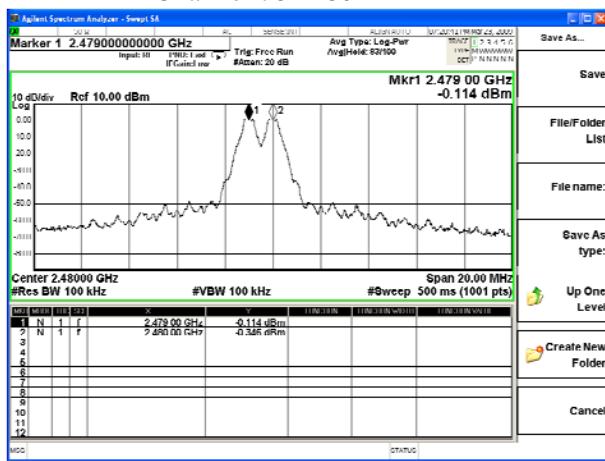
Channel 00 2402MHz



Channel 39 2441MHz



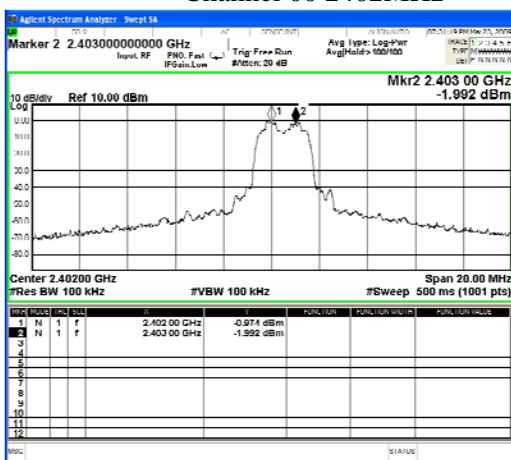
Channel 78 2480 MHz



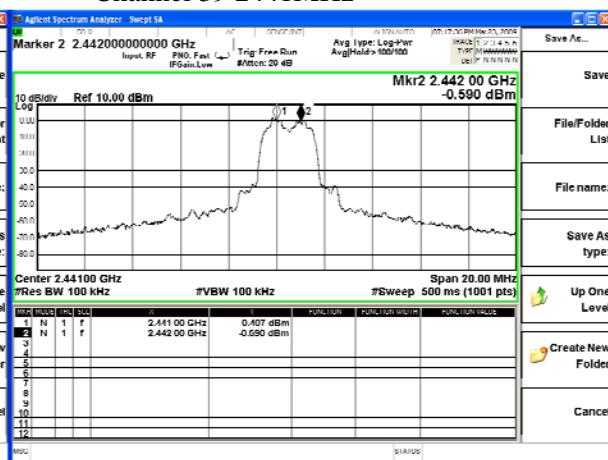
Product : Personal Navigation Device  
 Test Item : Channel Separation  
 Test Site : No.3 OATS  
 Test Mode : Mode 2: Transmitter - 3Mbps (8DPSK)

Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of (2/3)*20dB Bandwidth (kHz)	Result
2402	1000	>25 kHz	933.80	Pass
2441	1000	>25 kHz	940.47	Pass
2480	1000	>25 kHz	933.80	Pass

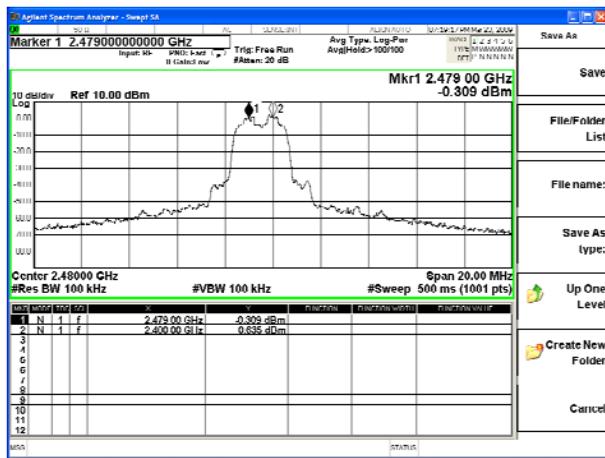
Channel 00 2402MHz



Channel 39 2441MHz



Channel 78 2480 MHz



## 9. Dwell Time

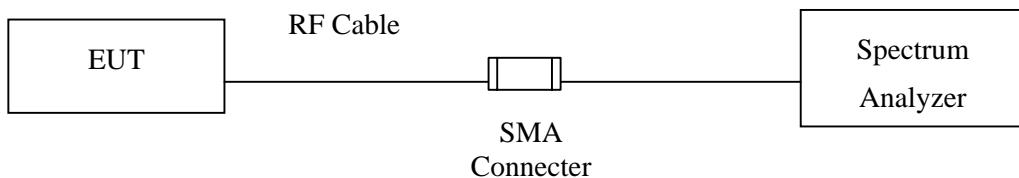
### 9.1. Test Equipment

The following test equipments are used during the radiated emission tests:

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Spectrum Analyzer	R&S	FSP40 / 100339	Jun, 2009
Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2009
X Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2009

Note: 1. All equipments are calibrated every one year.  
2. The test instruments marked by "X" are used to measure the final test results.

### 9.2. Test Setup



### 9.3. Limit

The dwell time shall be the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

### 9.4. Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

### 9.5. Uncertainty

± 25msec

## 9.6. Test Result of Dwell Time

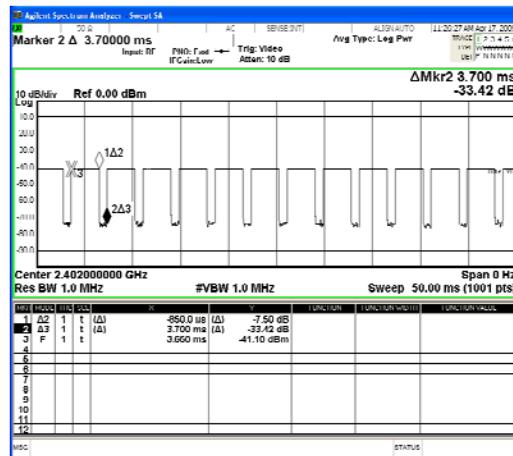
Product : Personal Navigation Device  
 Test Item : Dwell Time  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter - 1Mbps (GFSK) (Channel 00,39,78 -DH5)

Channel No.	Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Duty cycle	Dwell Time (Sec)	Limit (Sec)	Result
00	2402	2.850	13.0	50.0	0.74	0.296	0.4	Pass
39	2441	2.850	13.0	50.0	0.74	0.296	0.4	Pass
78	2480	2.850	13.0	50.0	0.74	0.296	0.4	Pass

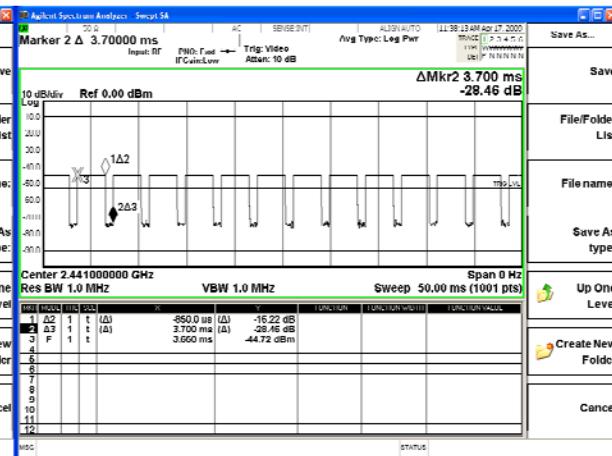
Note: Duty cycle =((Time slot length(ms)\*Hopping of Number) / Sweep time (ms)

Dwell time = (Duty cycle /79) \* (79\*0.4)

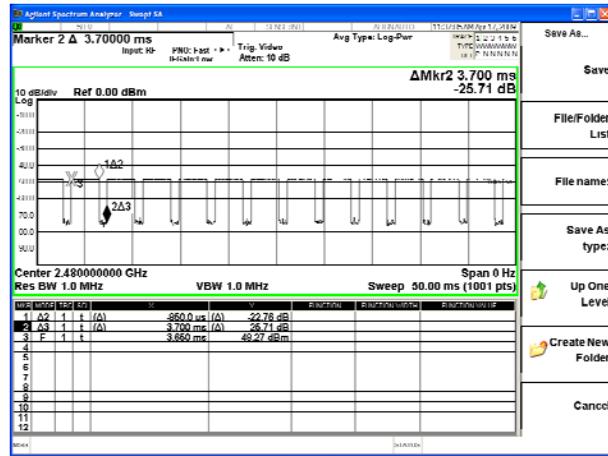
CH 00 2402MHz Dwell Time



CH 39 2441MHz Dwell Time



CH 78 2480MHz Dwell Time



Note: The dwell times of the packet type of DH1, DH3, and DH5 are tested. Only the worst case is shown on the report.

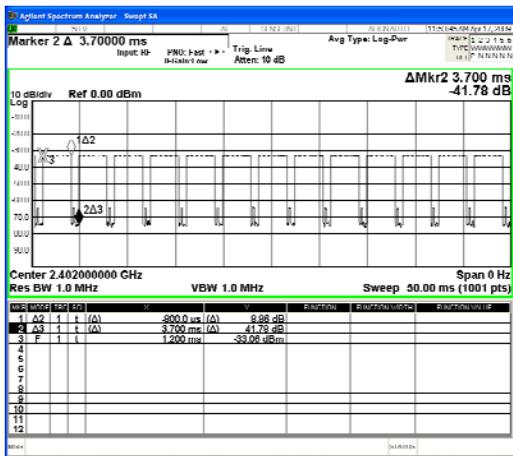
Product : Personal Navigation Device  
 Test Item : Dwell Time  
 Test Site : No.3 OATS  
 Test Mode : Mode 2: Transmitter - 3Mbps (8DPSK) (Channel 00,39,78 -DH5)

Channel No.	Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Duty cycle	Dwell Time (Sec)	Limit (Sec)	Result
00	2402	2.90	13	50	0.75	0.302	0.4	Pass
39	2441	2.90	13	50	0.75	0.302	0.4	Pass
78	2480	2.90	13	50	0.75	0.302	0.4	Pass

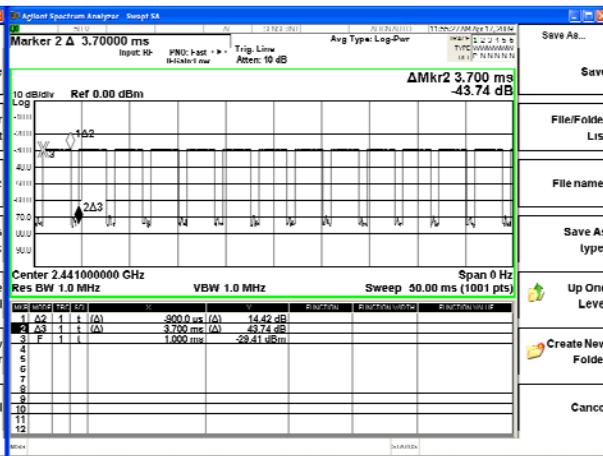
Note: Duty cycle =((Time slot length(ms)\*Hopping of Number) / Sweep time (ms)

Dwell time = (Duty cycle /79) \* (79\*0.4)

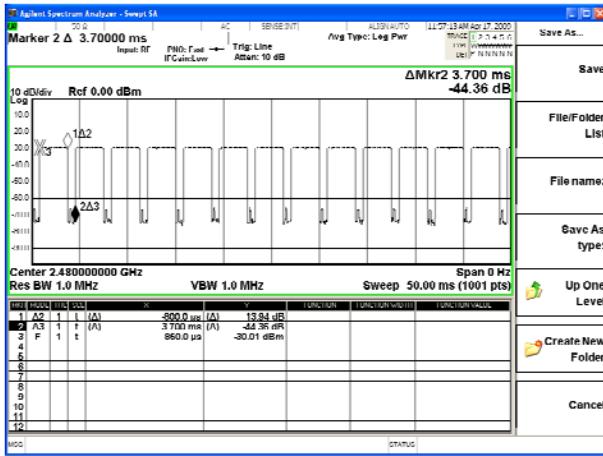
### CH 00 2402MHz Dwell Time



### CH 39 2441MHz Dwell Time



### CH 78 2480MHz Dwell Time



Note: The dwell times of the packet type of DH1, DH3, and DH5 are tested. Only the worst case is shown on the report.

## 10. Occupied Bandwidth

### 10.1. Test Equipment

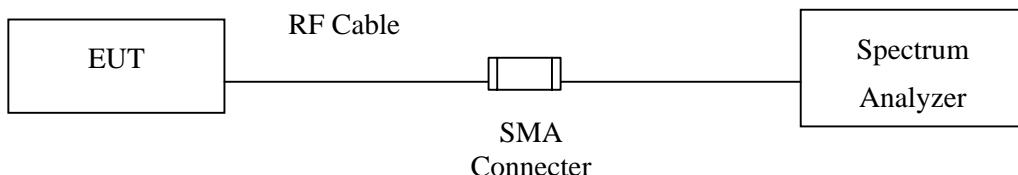
The following test equipments are used during the radiated emission tests:

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Spectrum Analyzer	R&S	FSP40 / 100339	Jun, 2009
Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2009
X Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2009

Note: 1. All equipments are calibrated every one year.

2. The test instruments marked by “X” are used to measure the final test results.

### 10.2. Test Setup



### 10.3. Limits

N/A

### 10.4. Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

### 10.5. Uncertainty

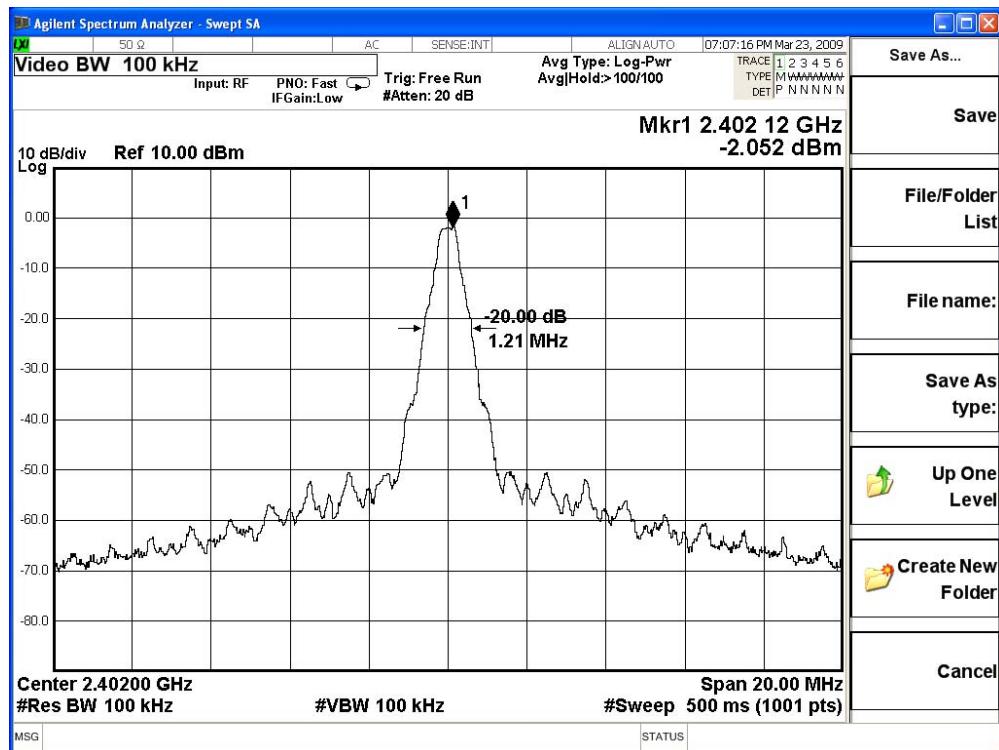
± 150Hz

## 10.6. Test Result of Occupied Bandwidth

Product : Personal Navigation Device  
Test Item : Occupied Bandwidth Data  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmitter - 1Mbps (GFSK)(2402MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	1210	--	NA

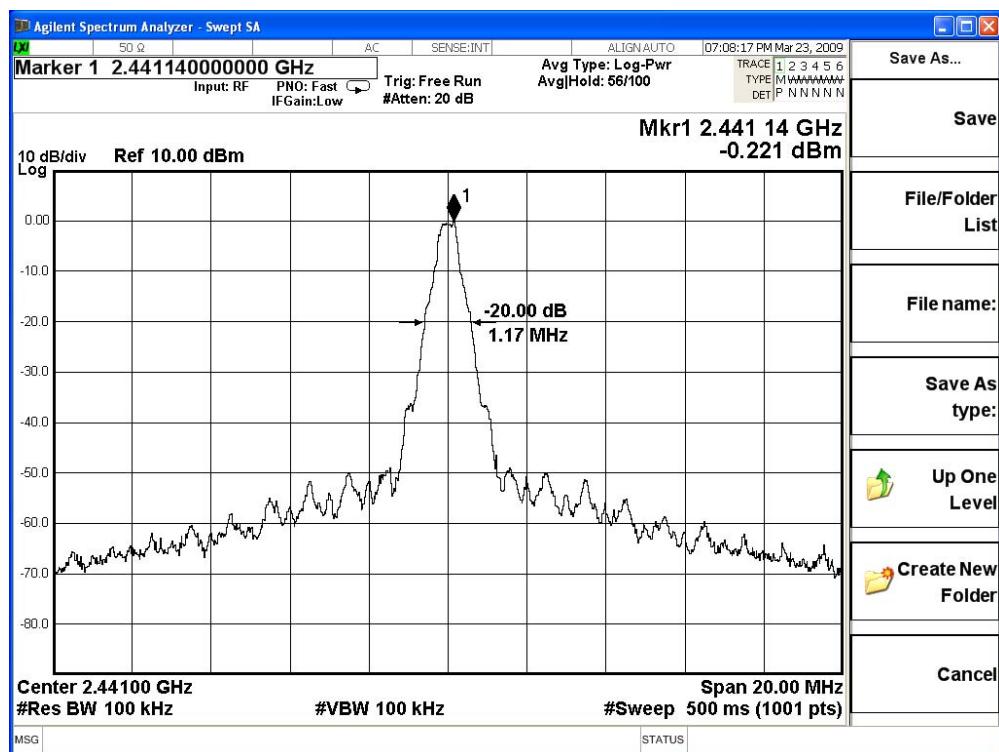
Figure Channel 00:



Product : Personal Navigation Device  
 Test Item : Occupied Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter - 1Mbps (GFSK)(2441MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
39	2441	1170	--	NA

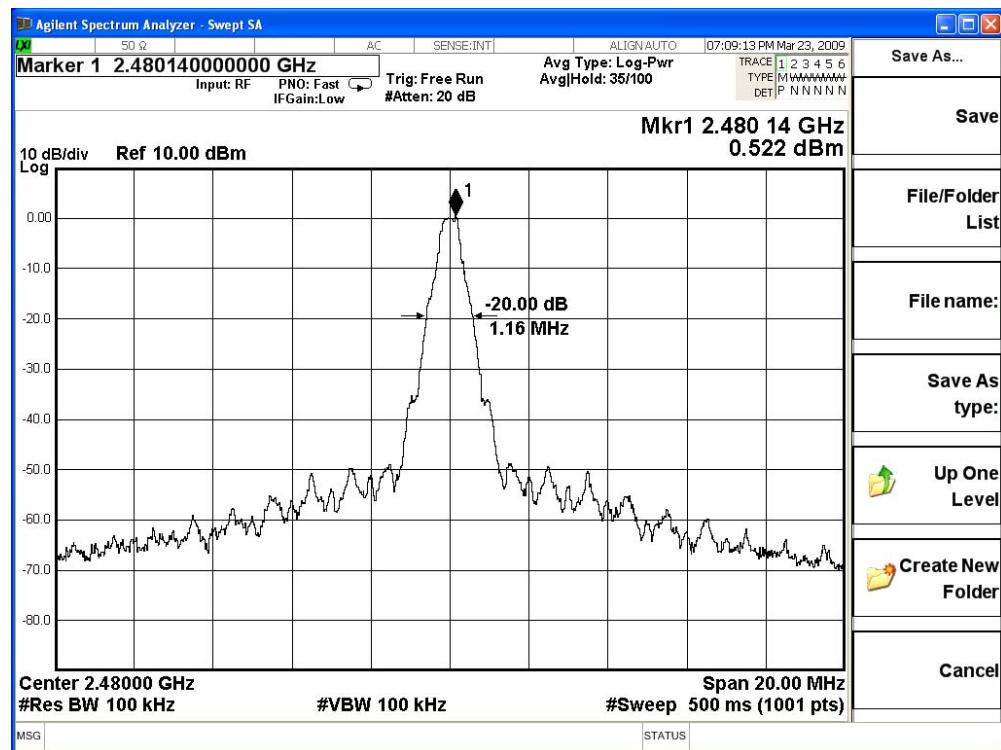
**Figure Channel 39:**



Product : Personal Navigation Device  
 Test Item : Occupied Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter - 1Mbps (GFSK)(2480MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
78	2480	1160	--	NA

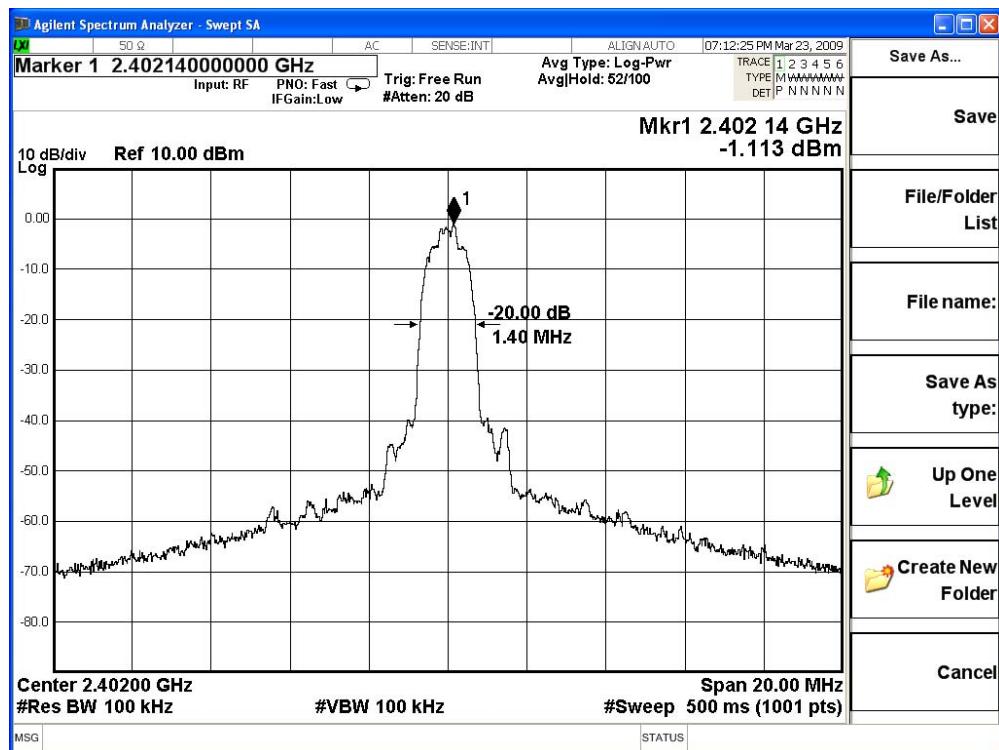
**Figure Channel 78:**



Product : Personal Navigation Device  
 Test Item : Occupied Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 2: Transmitter - 3Mbps (8DPSK) (2402MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	1400	--	NA

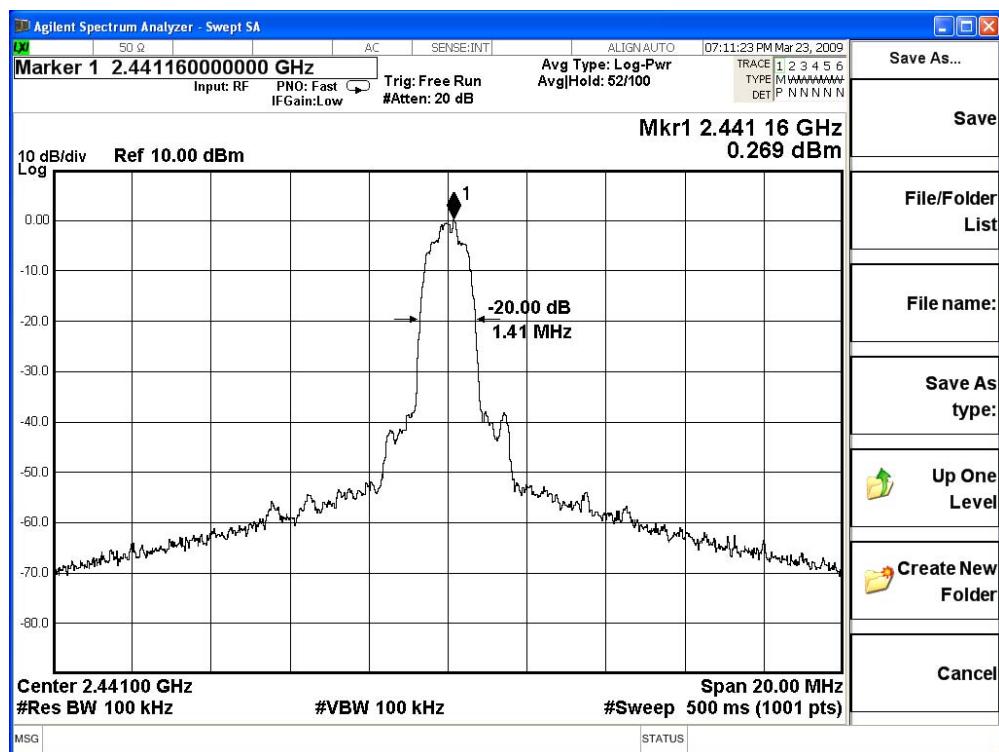
**Figure Channel 00:**



Product : Personal Navigation Device  
 Test Item : Occupied Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 2: Transmitter - 3Mbps (8DPSK) (2441MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
39	2441	1410	--	NA

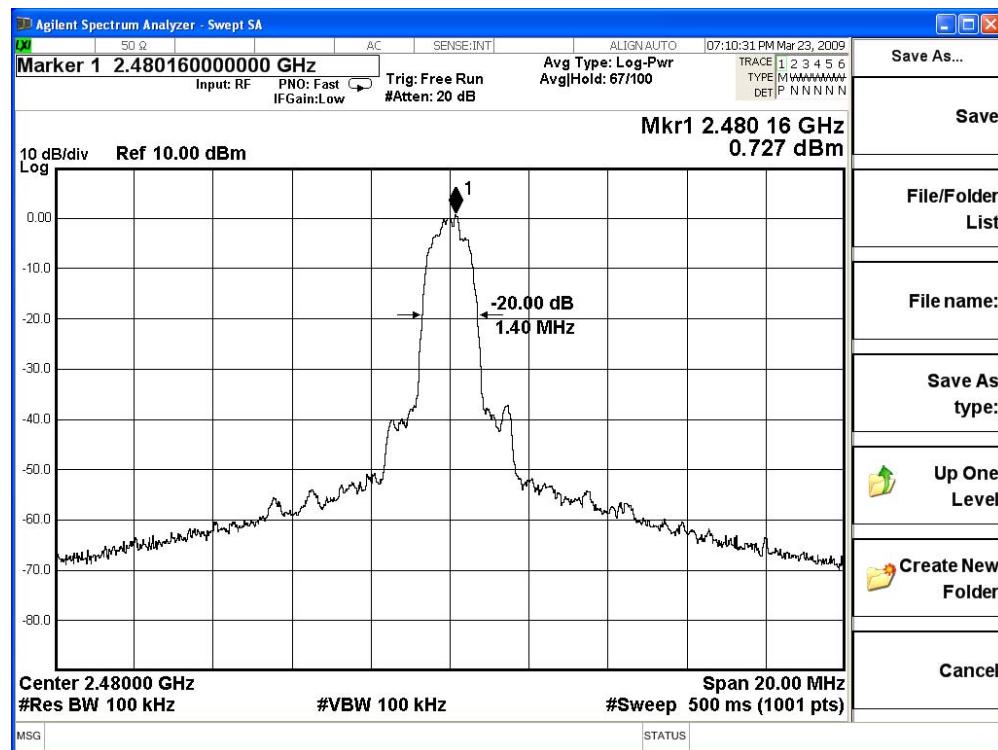
**Figure Channel 39:**



Product : Personal Navigation Device  
 Test Item : Occupied Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 2: Transmitter - 3Mbps (8DPSK)(2480MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
78	2480	1400	--	NA

**Figure Channel 78:**



**11. EMI Reduction Method During Compliance Testing**

No modification was made during testing.