



## 8. Maximum Peak Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(1)
Test Method:	ANSI C63.10:2013

### 8.1 Block Diagram Of Test Setup



### 8.2 Limit

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

For FHSs operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels. The e.i.r.p. shall not exceed 4 W.

### 8.3 Test procedure

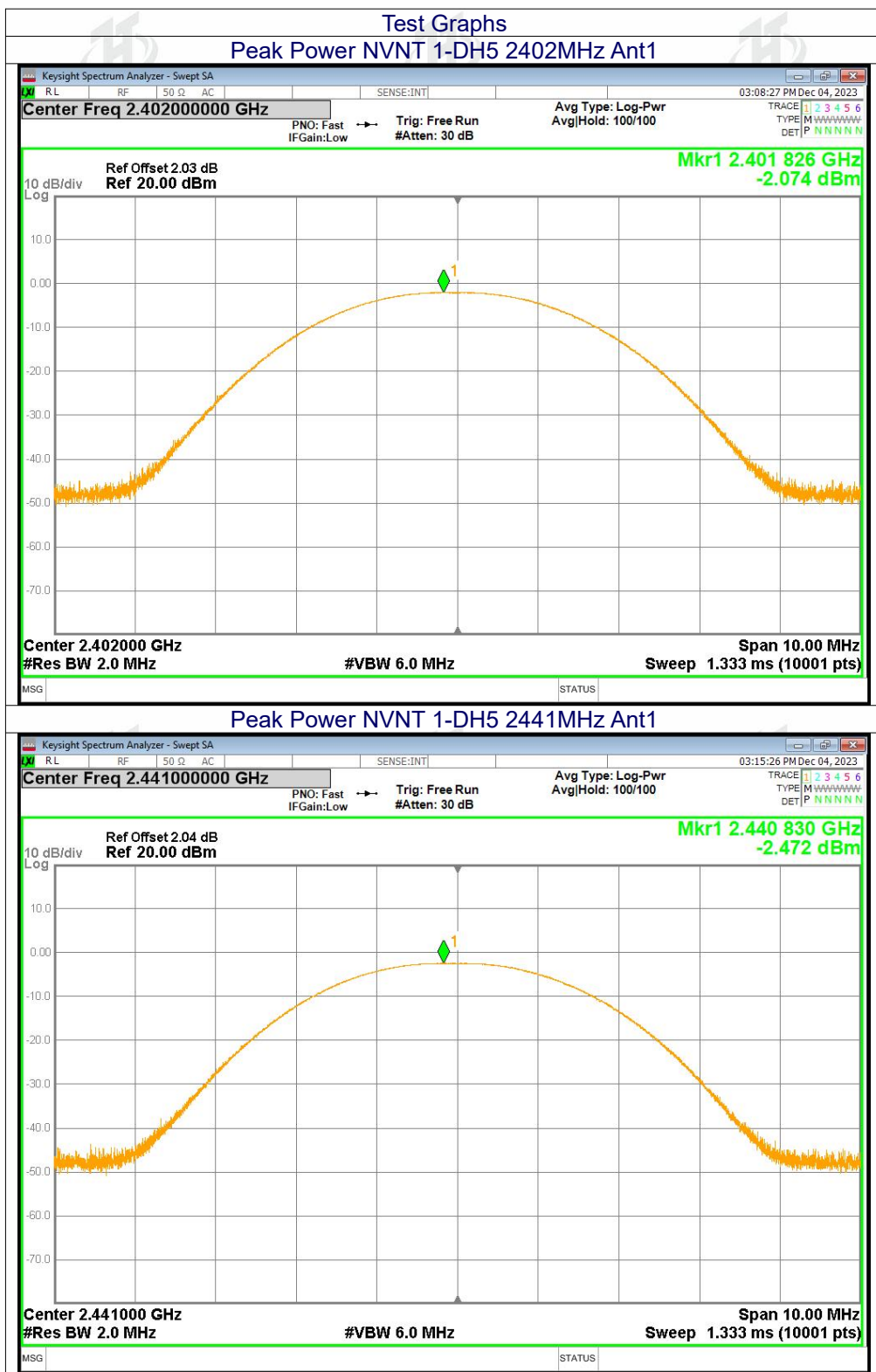
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 2MHz. VBW =6MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

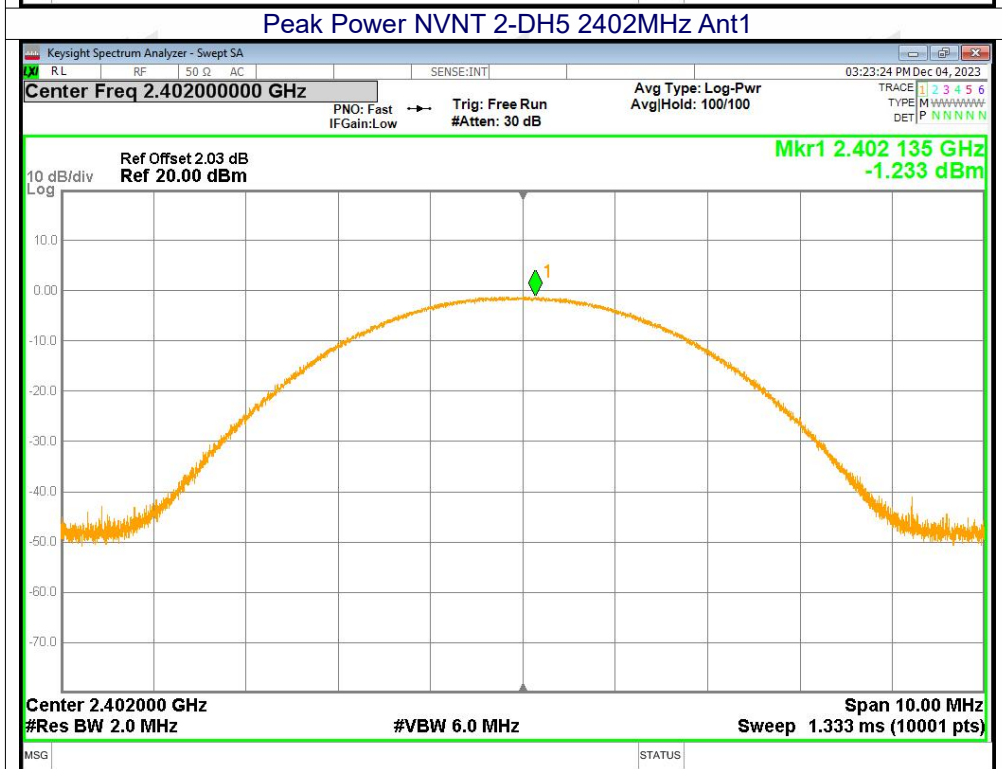
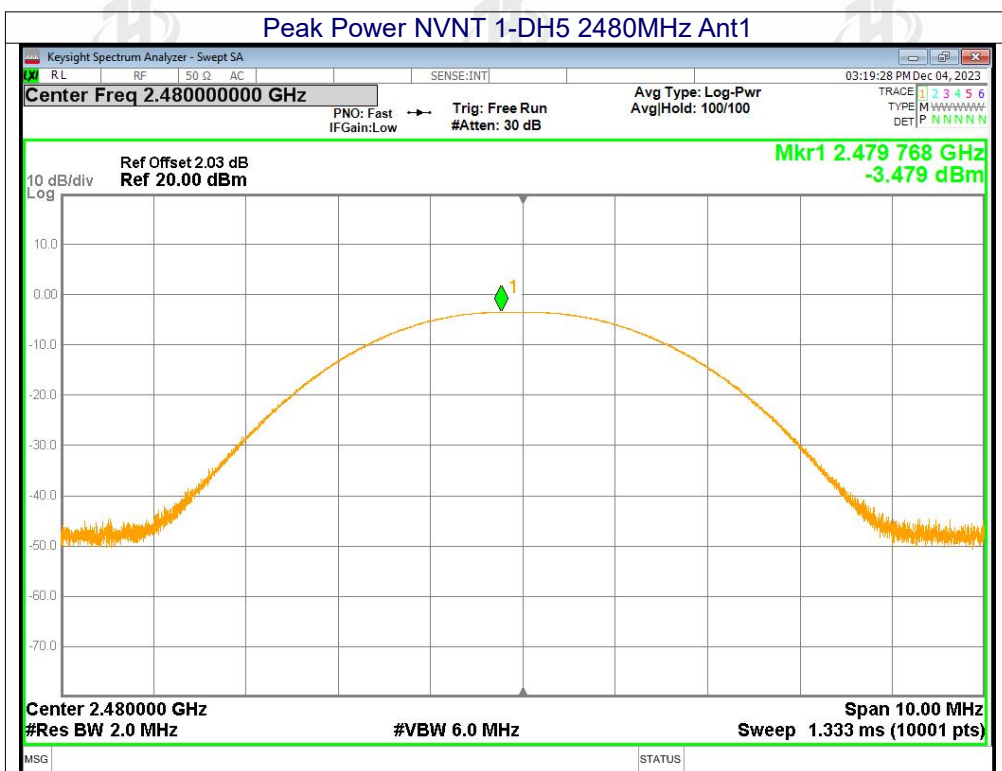
### 8.4 DEVIATION FROM STANDARD

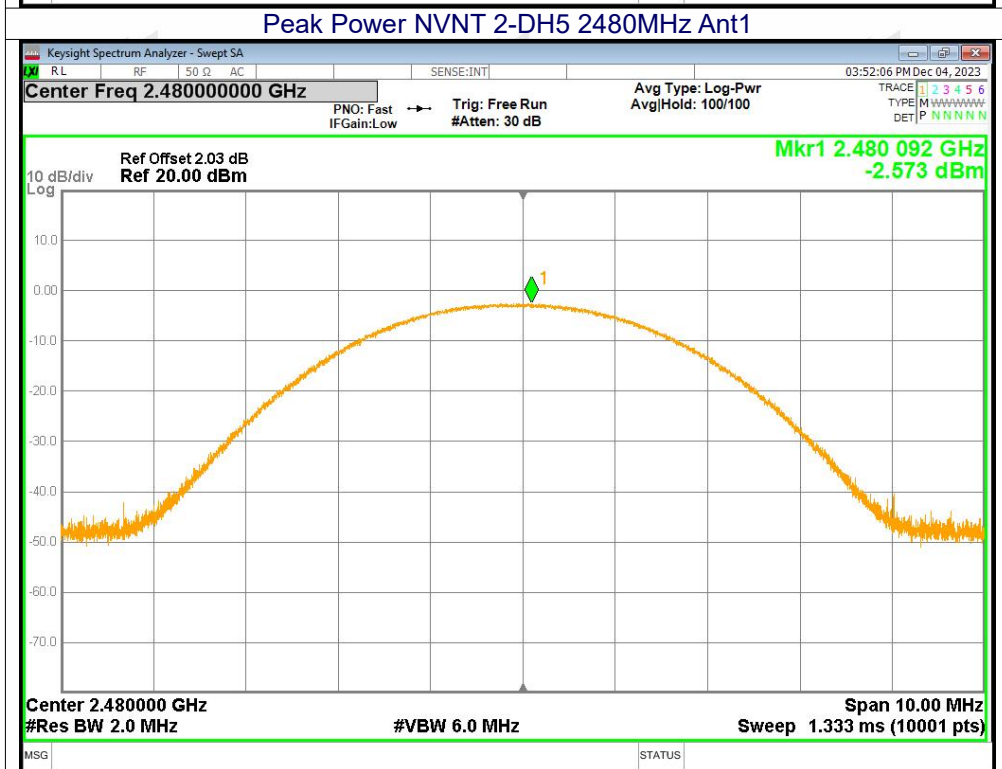
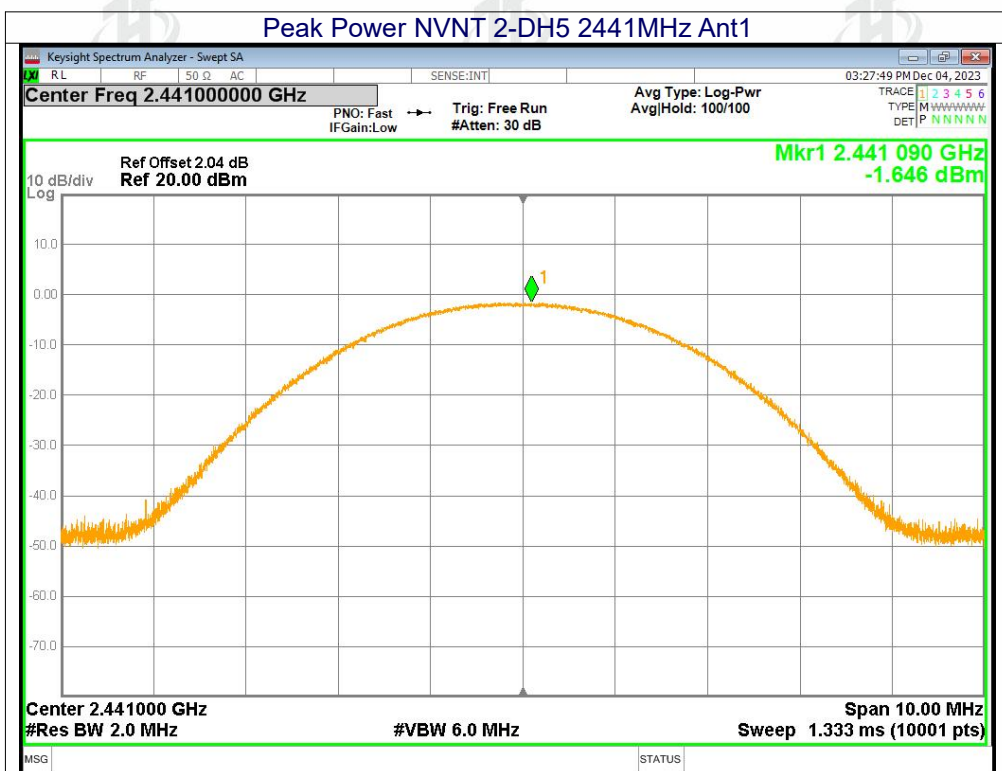
No deviation.

### 8.5 Test Result

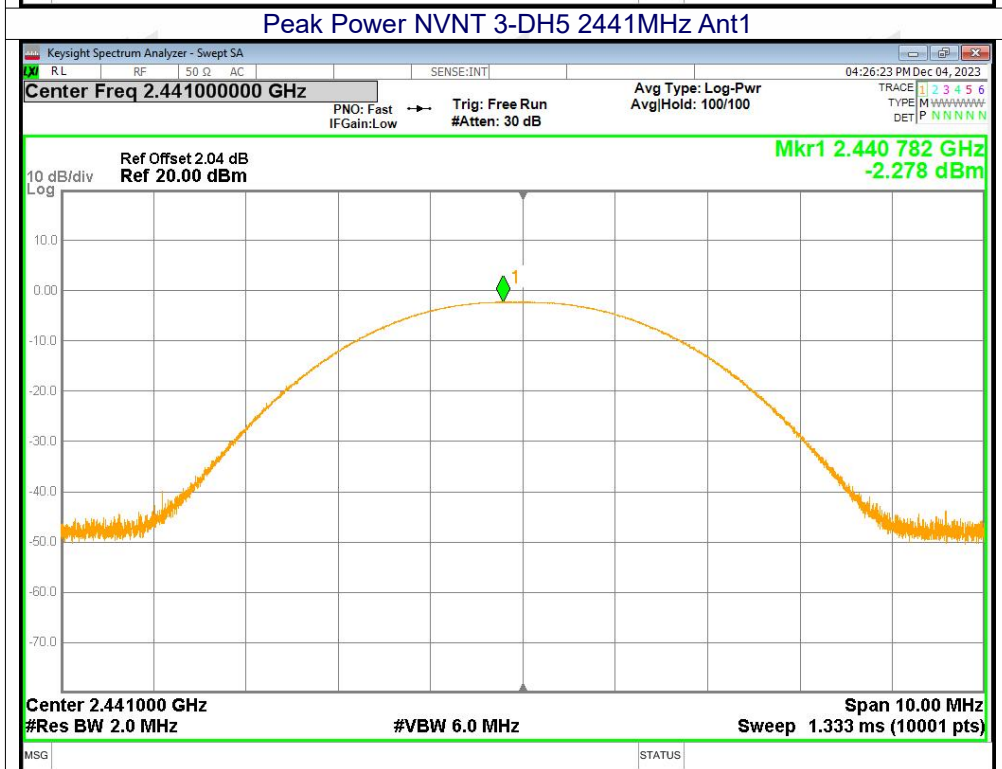
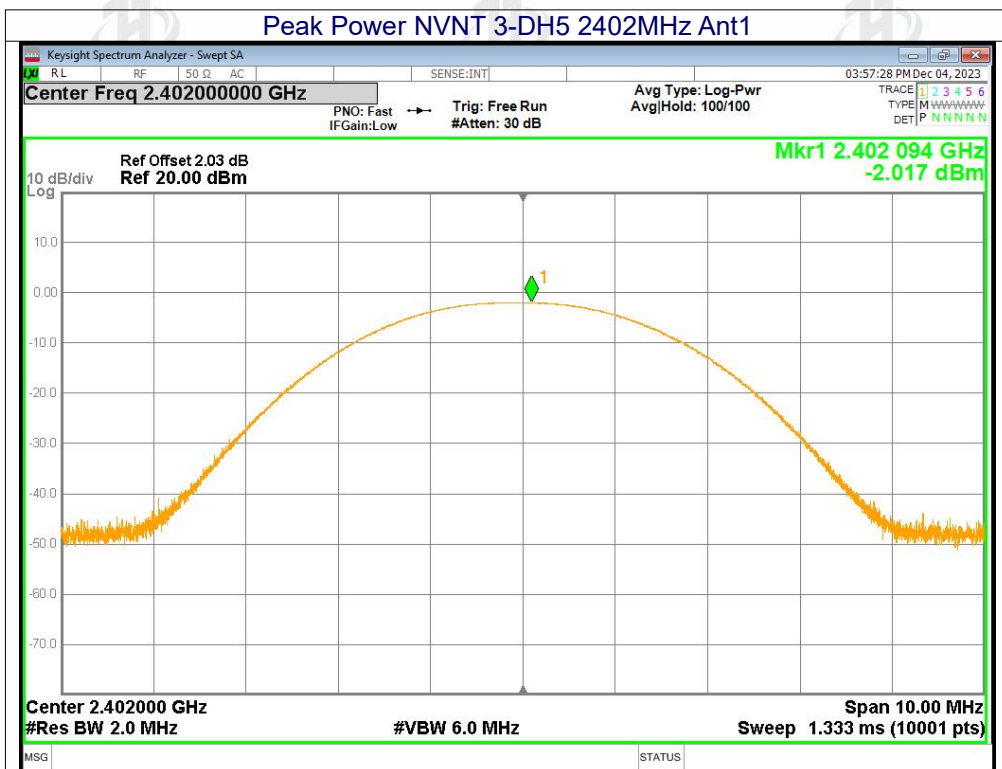
Mode	Test channel	Peak Output Power (dBm)	FCC Limit (dBm)	Result
GFSK	Lowest	-2.07	30.00	Pass
	Middle	-2.47		
	Highest	-3.48		
$\pi/4$ DQPSK	Lowest	-1.23	21.00	Pass
	Middle	-1.65		
	Highest	-2.57		
8DPSK	Lowest	-2.02	21.00	Pass
	Middle	-2.28		
	Highest	-3.41		

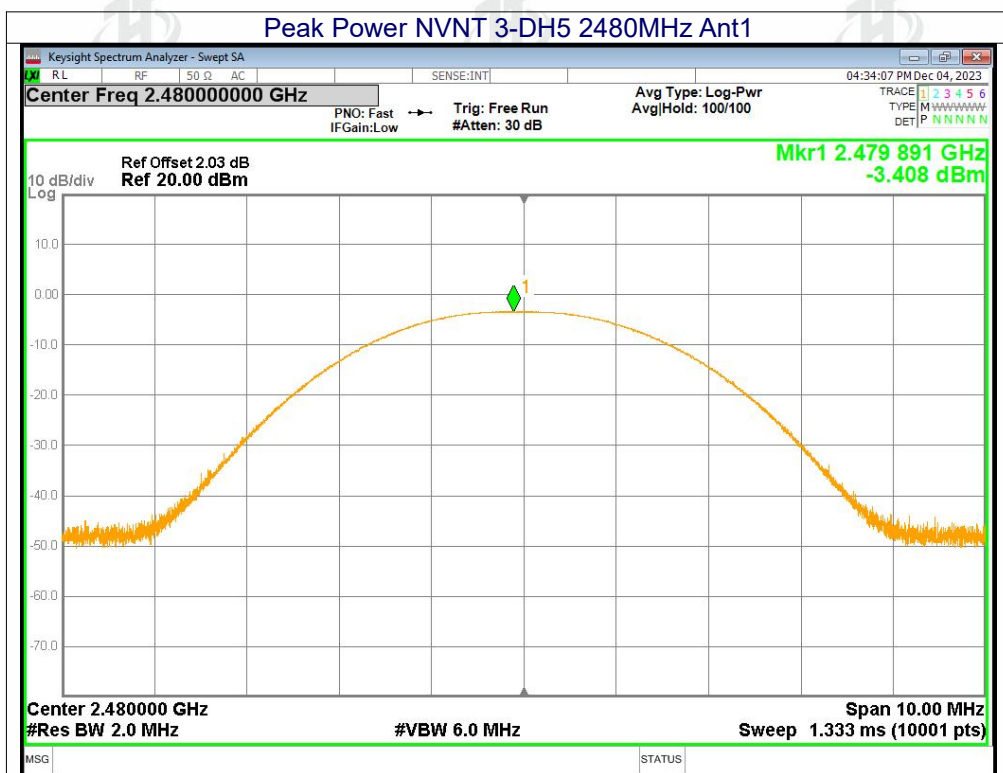








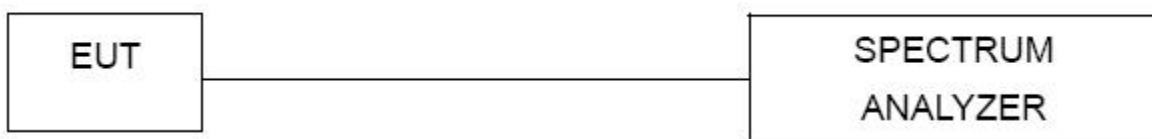




## 9. HOPPING CHANNEL SEPARATION

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=30KHz, VBW=100KHz, detector=Peak
Limit:	GFSK, $\pi/4$ -DQPSK & 8DSK: 0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)

### 9.1 Test Setup



### 9.2 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 30kHz. VBW = 100kHz , Span = 2.0MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

### 9.3 DEVIATION FROM STANDARD

No deviation.

#### 9.4 Test Result

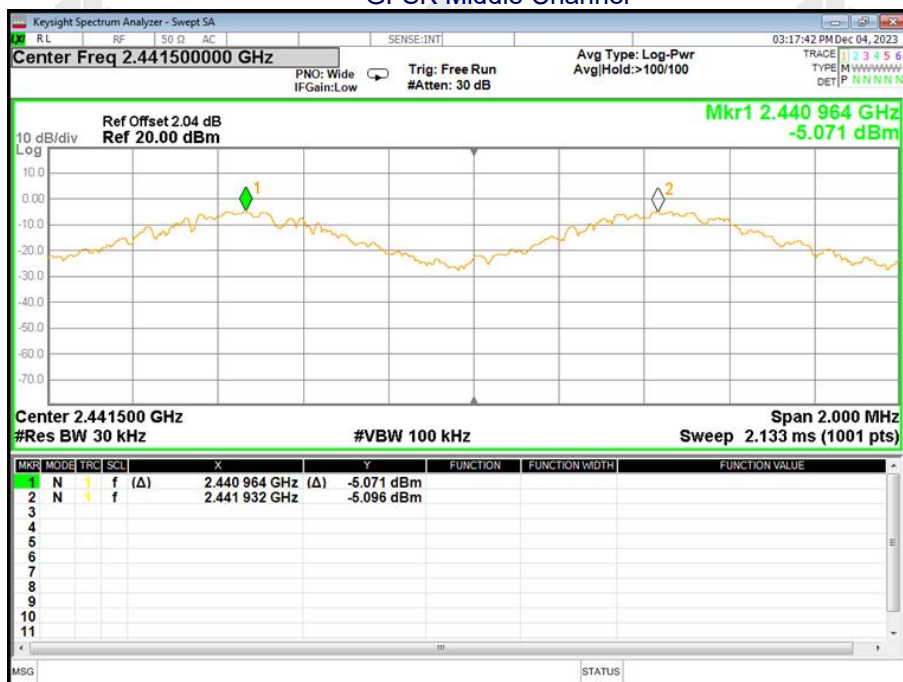
Modulation	Test Channel	Separation (MHz)	Limit(MHz)	Result
GFSK	Low	1.030	0.634	PASS
GFSK	Middle	0.968	0.635	PASS
GFSK	High	0.988	0.634	PASS
$\pi/4$ DQPSK	Low	1.154	0.851	PASS
$\pi/4$ DQPSK	Middle	0.998	0.853	PASS
$\pi/4$ DQPSK	High	0.986	0.857	PASS
8DPSK	Low	1.138	0.857	PASS
8DPSK	Middle	1.362	0.855	PASS
8DPSK	High	1.004	0.871	PASS

Test plots  
GFSK Low Channel

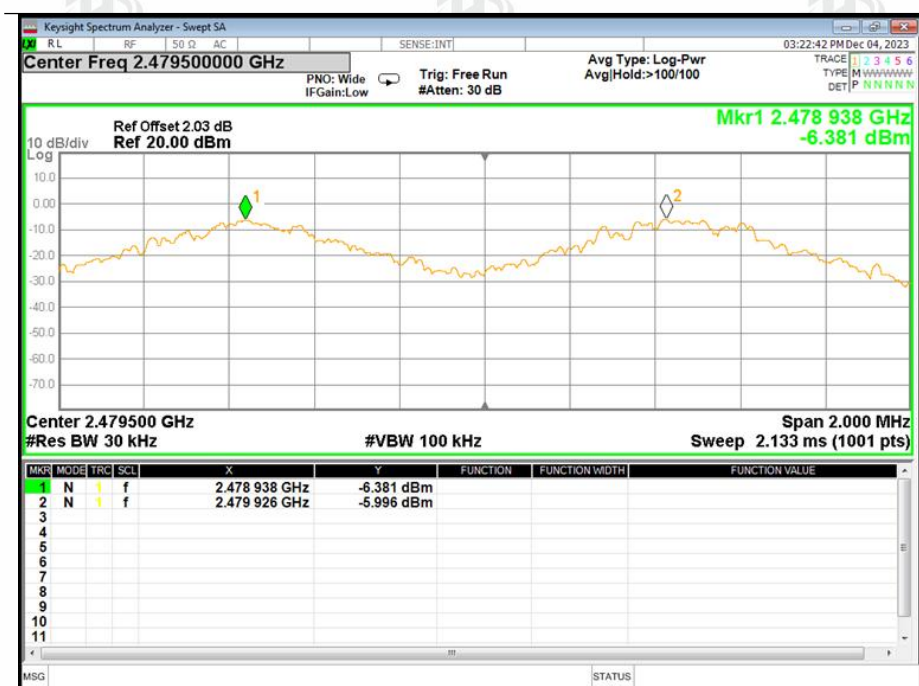




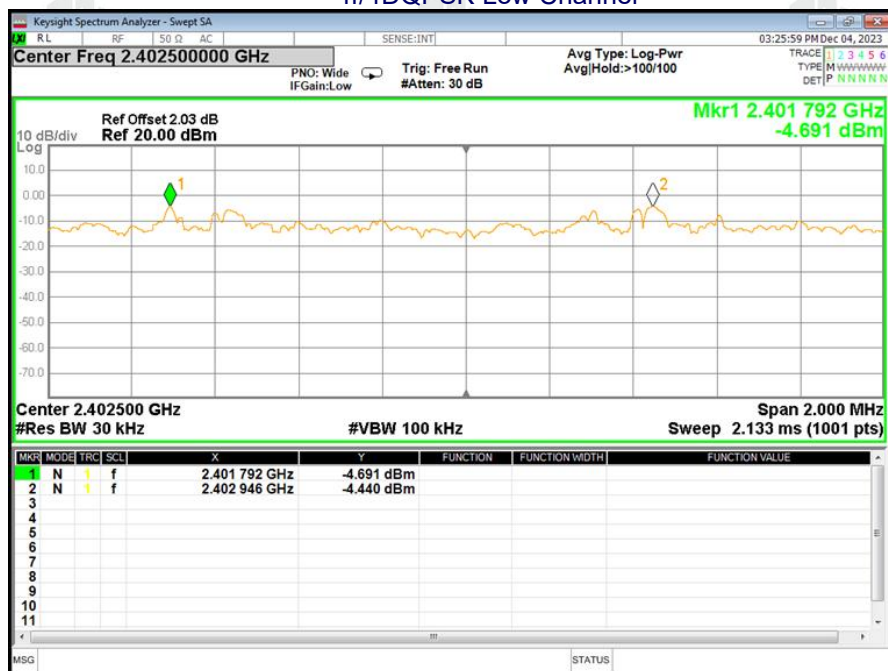
### GFSK Middle Channel



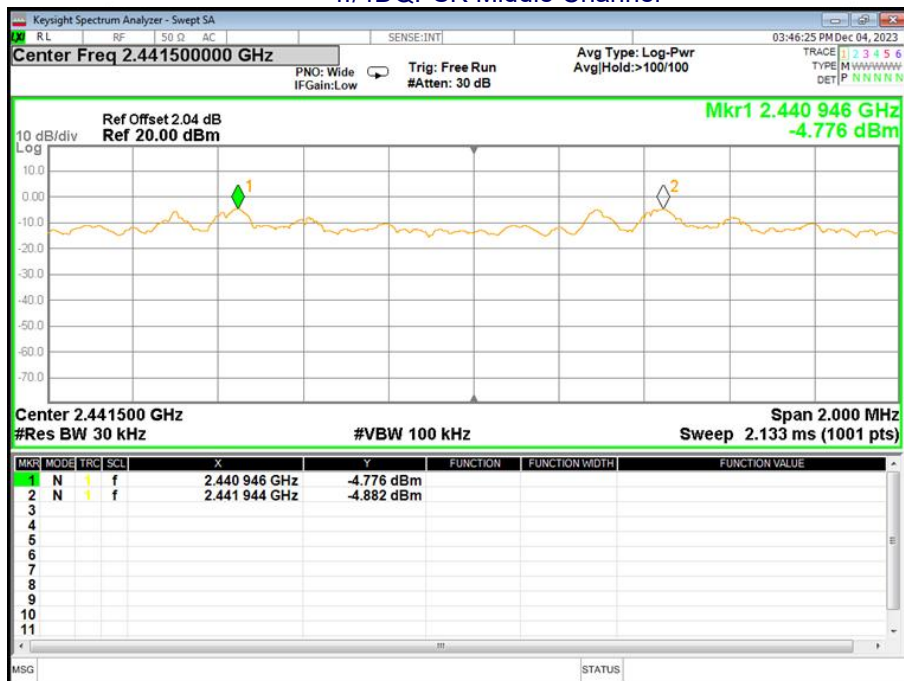
### GFSK High Channel



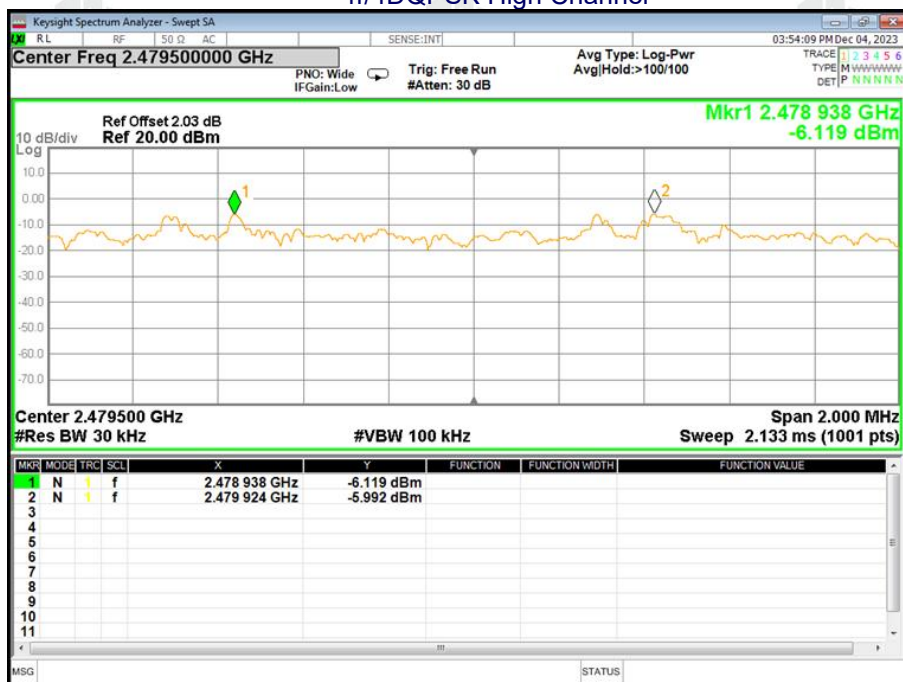
### $\pi/4$ DQPSK Low Channel



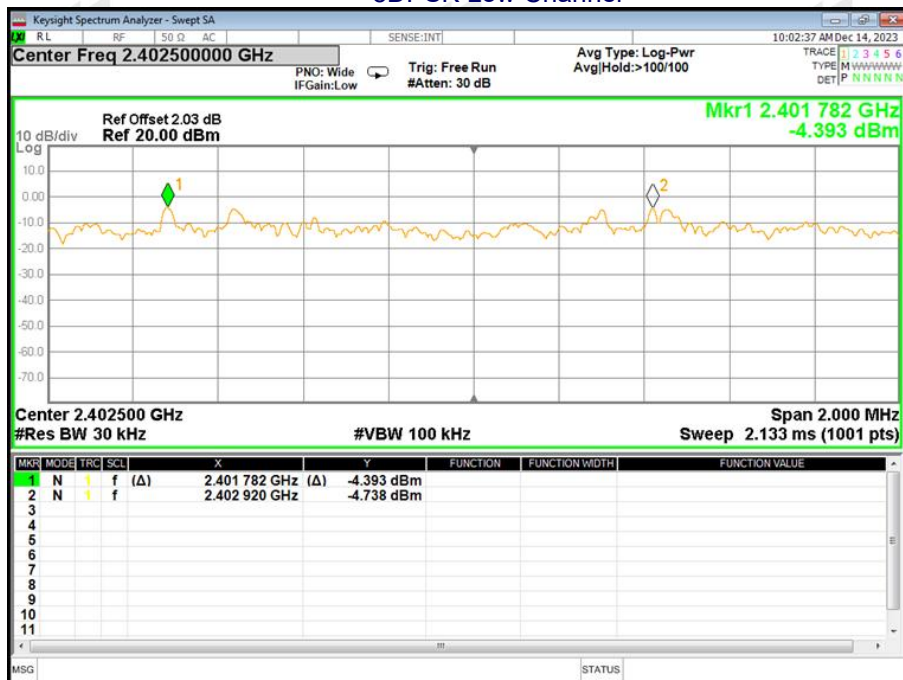
### $\pi/4$ DQPSK Middle Channel



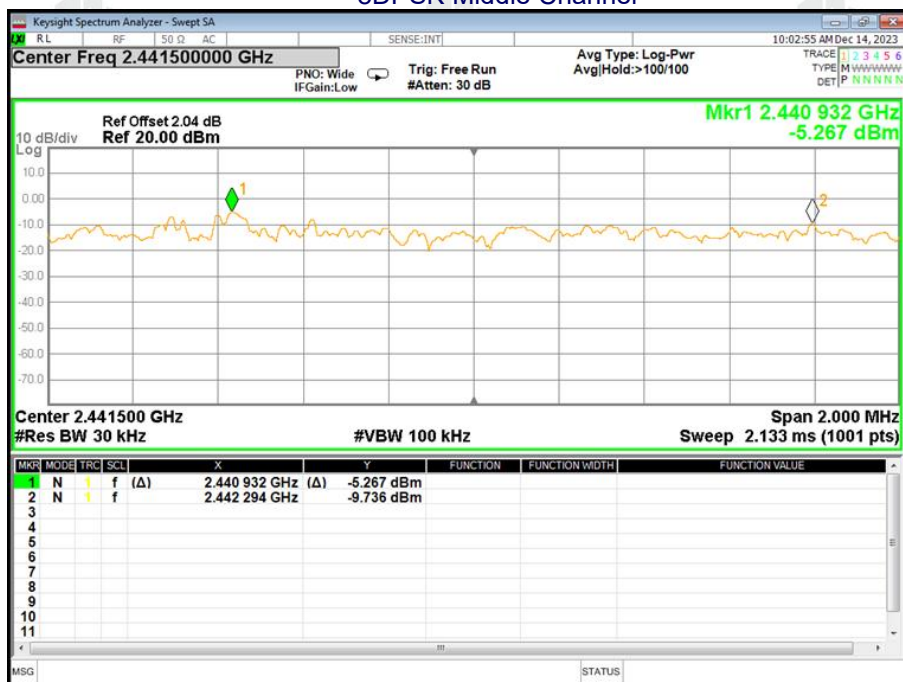
### $\pi/4$ DQPSK High Channel



### 8DPSK Low Channel



### 8DPSK Middle Channel



### 8DPSK High Channel

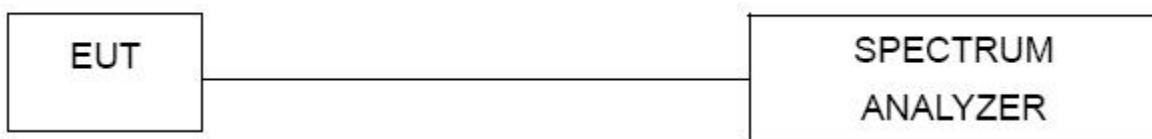




#### 10.NUMBER OF HOPPING FREQUENCY

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak
Limit:	15 channels

##### 10.1 Test Setup



##### 10.2 Test procedure

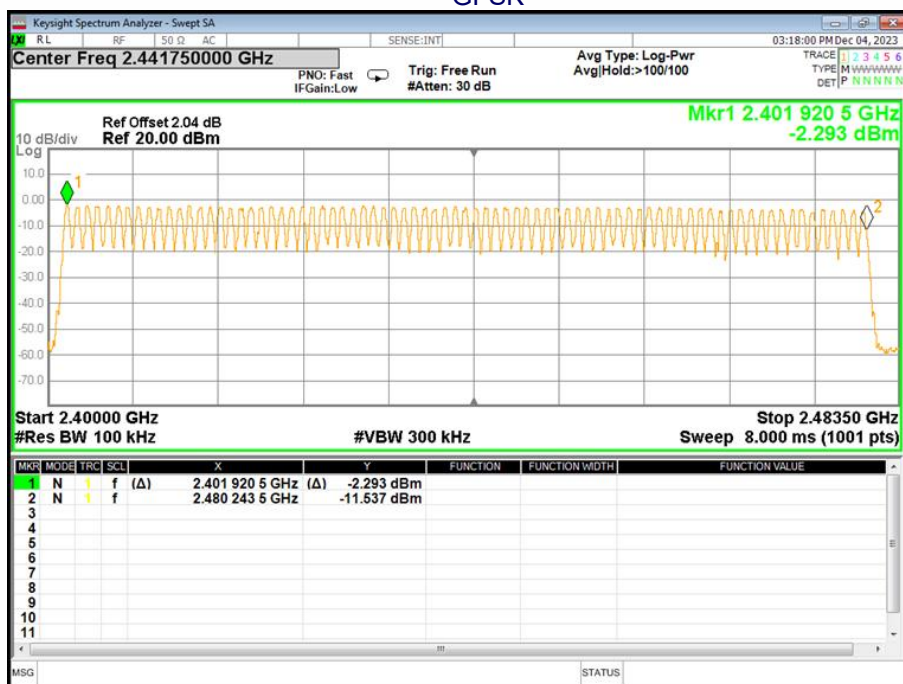
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100kHz. VBW = 300kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.
4. Set the spectrum analyzer: Start Frequency = 2.4GHz, Stop Frequency = 2.4835GHz. Sweep=auto;

##### 10.3 DEVIATION FROM STANDARD

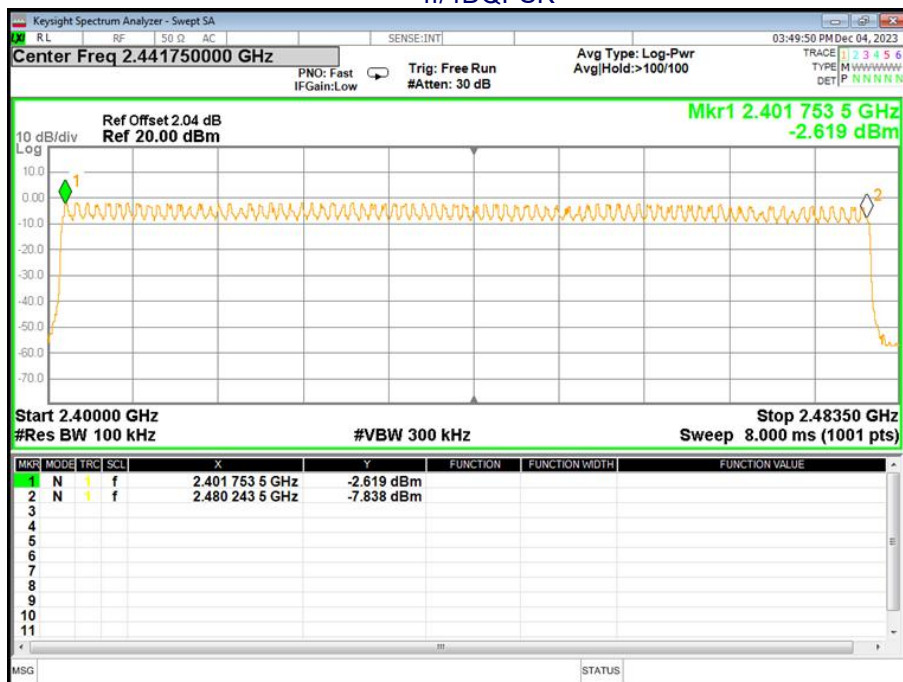
No deviation.

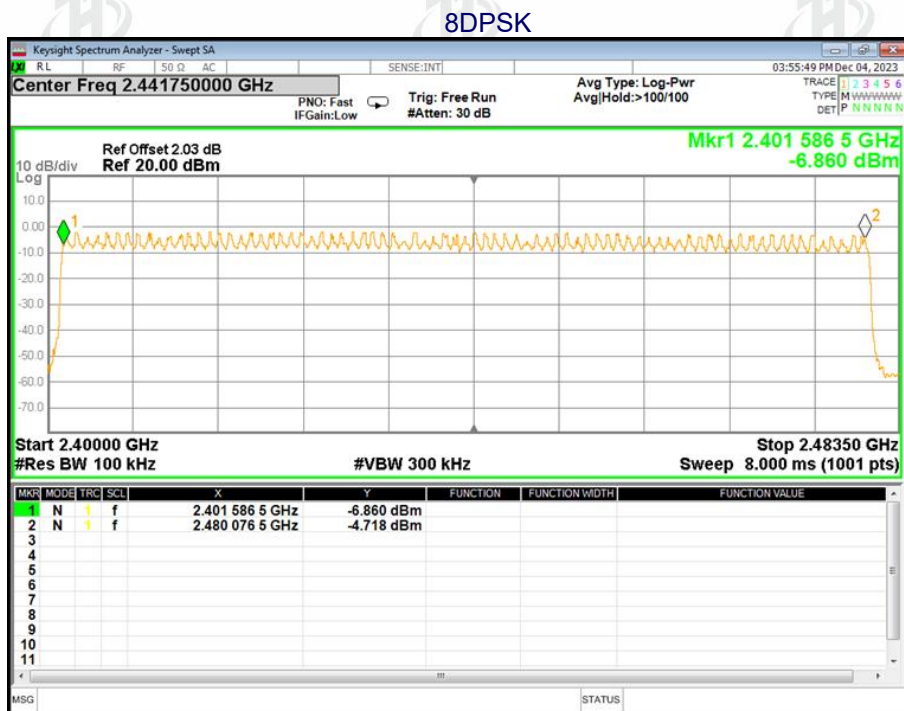
## 10.4 Test Result

Test Plots:  
79 Channels in total  
GFSK



$\pi/4$ DQPSK

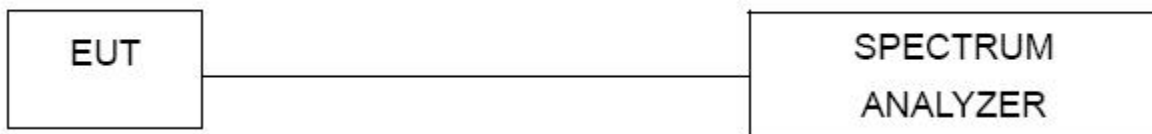




## 11. DWELL TIME

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=1MHz, VBW=3MHz, Span=0Hz, Detector=Peak
Limit:	0.4 Second

### 11.1 Test Setup



### 11.2 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set spectrum analyzer span = 0Hz;
3. Set RBW = 1MHz and VBW = 3MHz. Sweep = as necessary to capture the entire dwell time per hopping channel. Set the EUT for DH5, DH3 and DH1 packet transmitting.
4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g.. data rate. modulation format. etc.). repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

### 11.3 DEVIATION FROM STANDARD

No deviation.



#### 11.4 Test Result

Mode	Frequency (MHz)	Antenna	Pulse Time (ms)	Total Dwell Time (ms)	Burst Count	Period Time (ms)	Limit (ms)	Verdict
1-DH1	2441	Ant1	0.383	121.411	317	31600	400	Pass
1-DH3	2441	Ant1	1.638	273.546	167	31600	400	Pass
1-DH5	2441	Ant1	2.886	326.118	113	31600	400	Pass
2-DH1	2441	Ant1	0.391	123.556	316	31600	400	Pass
2-DH3	2441	Ant1	1.643	261.237	159	31600	400	Pass
2-DH5	2441	Ant1	2.891	274.645	95	31600	400	Pass
3-DH1	2441	Ant1	0.391	124.338	318	31600	400	Pass
3-DH3	2441	Ant1	1.644	263.04	160	31600	400	Pass
3-DH5	2441	Ant1	2.891	294.882	102	31600	400	Pass

#### Remarks:

The test period:  $T = 0.4 \text{ Second/Channel} \times 79 \text{ Channel} = 31.6 \text{ s}$

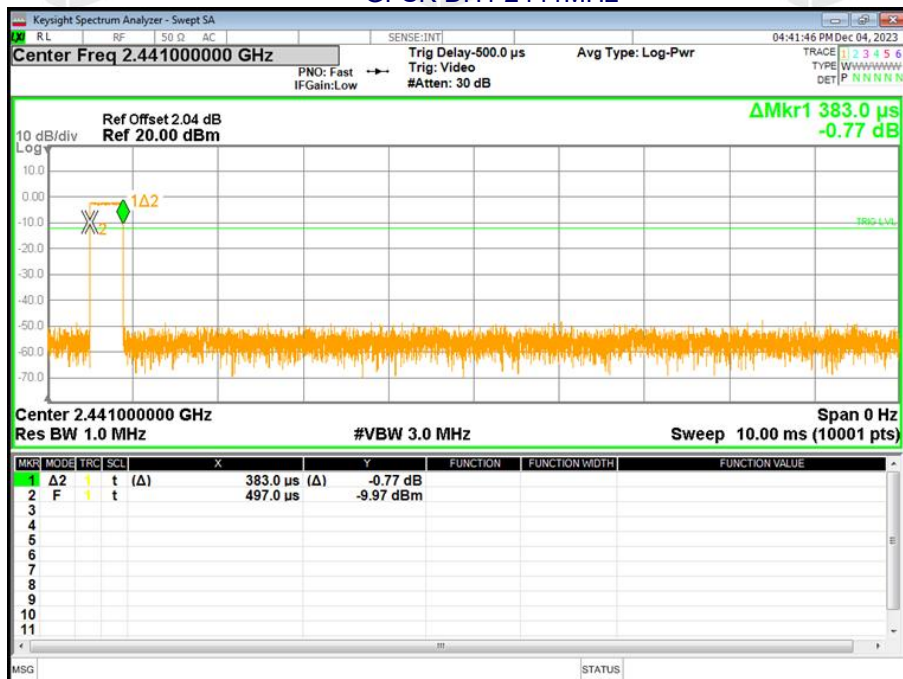
(1 / 2 / 3)-DH1: Dwell time (ms) = Pulse Time (ms) \*  $[1600 / (2 * 79)] * 31.6\text{s}$

(1 / 2 / 3)-DH3: Dwell time (ms) = Pulse Time (ms) \*  $[1600 / (4 * 79)] * 31.6\text{s}$

(1 / 2 / 3)-DH5: Dwell time (ms) = Pulse Time (ms) \*  $[1600 / (6 * 79)] * 31.6\text{s}$

### Test Plots

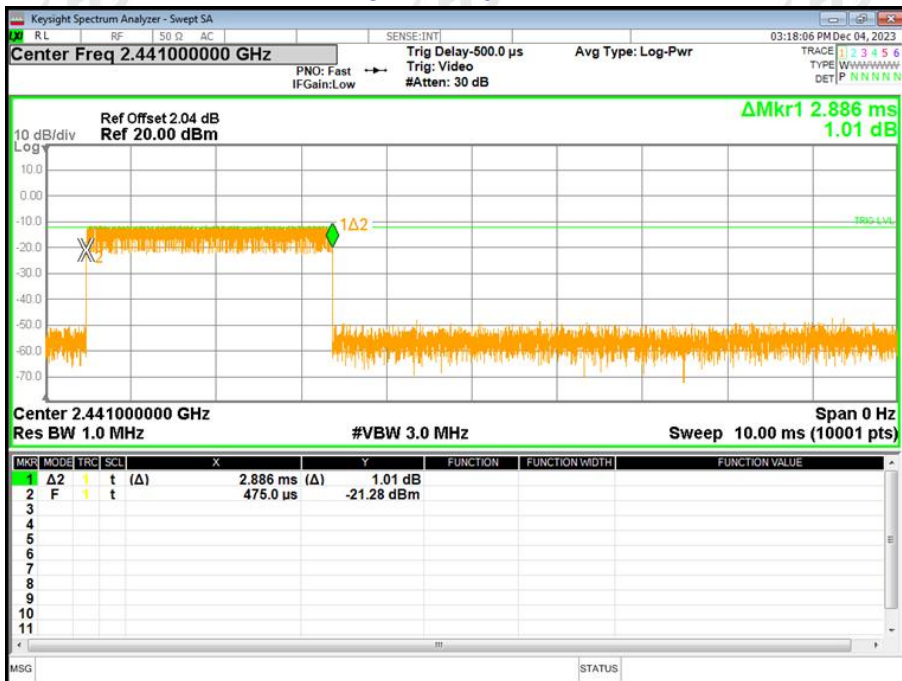
#### GFSK DH1 2441MHz



#### GFSK DH3 2441MHz



### GFSK DH5 2441MHz



### $\pi/4$ DQPSK 2DH1 2441MHz



$\pi/4$ DQPSK 2DH3 2441MHz



$\pi/4$ DQPSK 2DH5 2441MHz



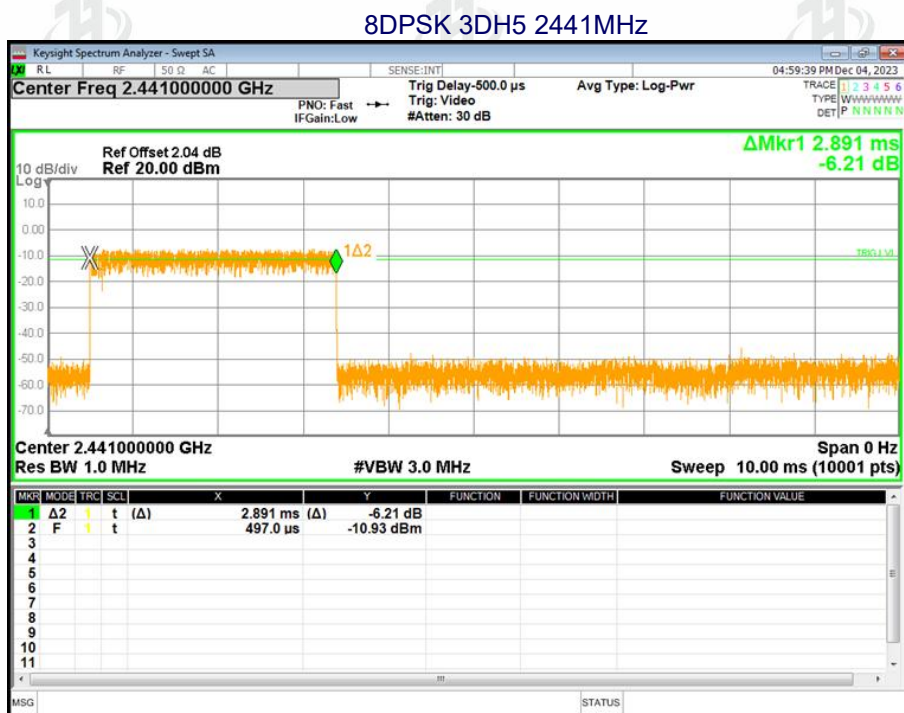


### 8DPSK 3DH1 2441MHz



### 8DPSK 3DH3 2441MHz





## 12. Antenna Requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(b)(4)
<p>15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p> <p>15.247(b) (4) requirement: (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.</p>	
EUT Antenna:	
The antenna is Bipolar antenna, the best case gain of the antennas is 2.67 dBi, reference to the appendix II for details	

### 13. Test Setup Photo

Reference to the appendix I for details.

### 14. EUT Constructional Details

Reference to the appendix II for details.

\*\*\*\*\* END OF REPORT \*\*\*\*\*