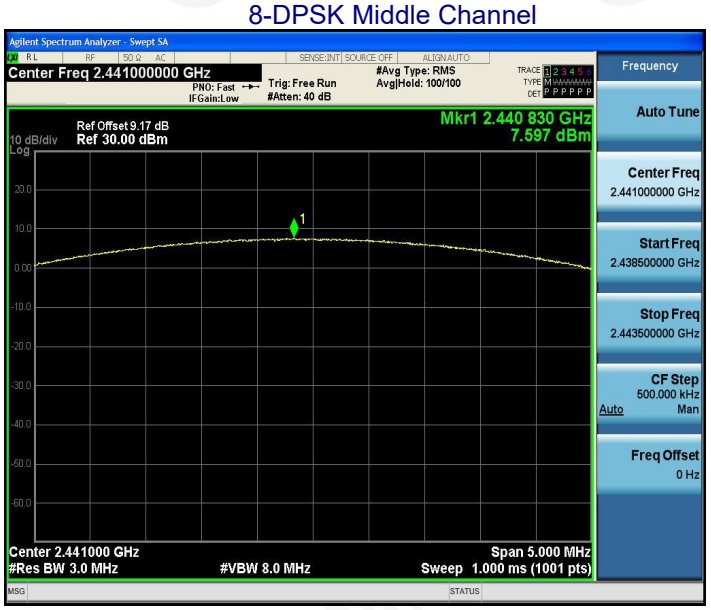
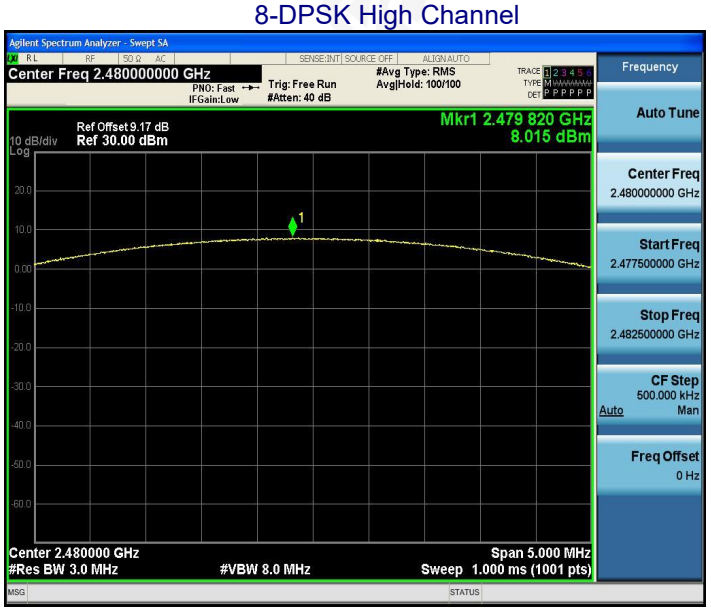
8-DPSK Middle Channel




8-DPSK High Channel



## 9. HOPPING CHANNEL SEPARATION

| | |
|---|---|
| Test Requirement: | FCC Part15 C Section 15.247 (a)(1) |
| Test Method: | ANSI C63.10:2013 |
| Receiver setup: | RBW=100KHz, VBW=300KHz, detector=Peak |
| Limit: | GFSK: 20dB bandwidth<br>π/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 = 100kHz. VBW = 300kHz , Span = 3.0MHz. 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

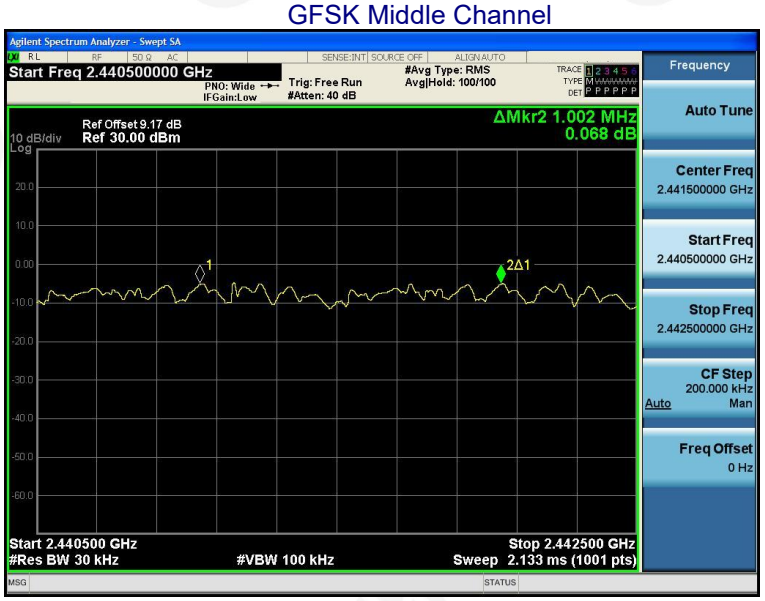
No deviation.

### 9.4 Test Result

| Modulation | Test Channel | Separation (MHz) | Limit(MHz) | Result |
|---|---|---|---|---|
| GFSK | Low | 0.998 | 0.703 | PASS |
| GFSK | Middle | 1.002 | 0.701 | PASS |
| GFSK | High | 1.002 | 0.699 | PASS |
| π/4-DQPSK | Low | 1.002 | 0.916 | PASS |
| π/4-DQPSK | Middle | 1.000 | 0.917 | PASS |
| π/4-DQPSK | High | 1.002 | 0.913 | PASS |
| 8-DPSK | Low | 1.000 | 0.896 | PASS |
| 8-DPSK | Middle | 0.998 | 0.891 | PASS |
| 8-DPSK | High | 1.002 | 0.883 | PASS |

Test plots
GFSK Low Channel

GFSK Middle Channel

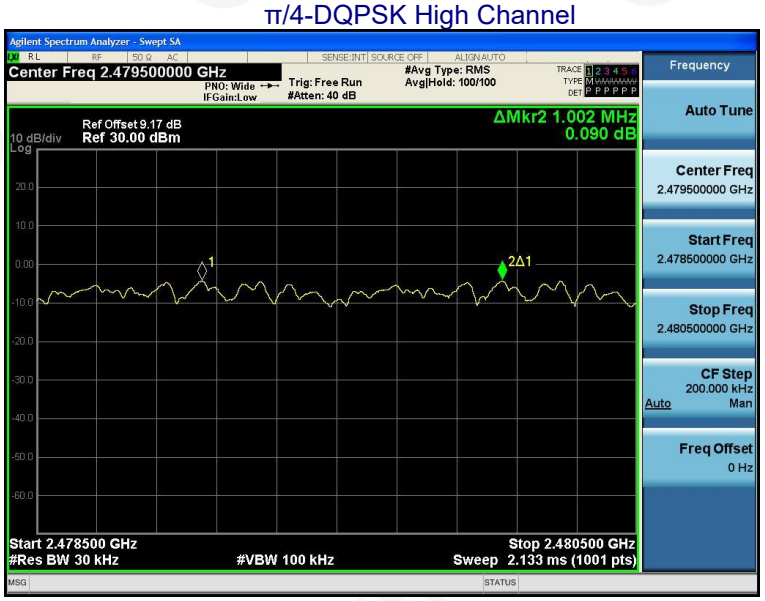



GFSK High Channel

π/4-DQPSK Low Channel

π/4-DQPSK Middle Channel

π/4-DQPSK High Channel




8-DPSK Low Channel

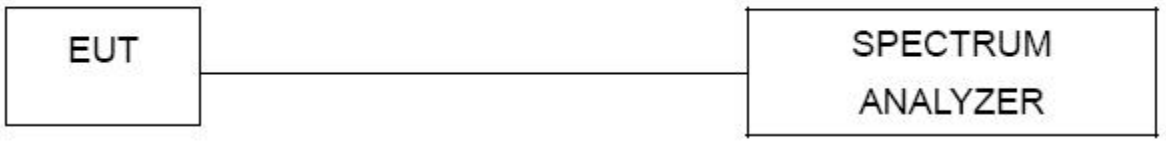
8-DPSK Middle Channel

8-DPSK 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.

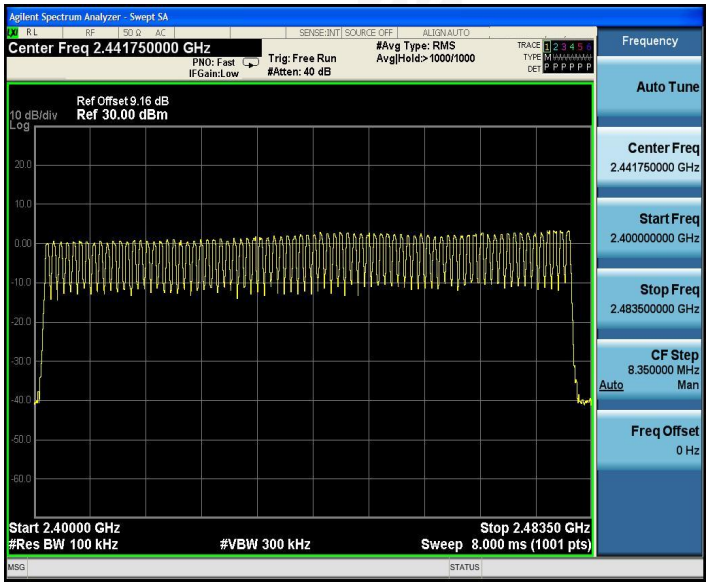
4. Set the spectrum analyzer: Start Frequency = 2.4GHz, Stop Frequency = 2.4835GHz. Sweep=auto;

10.3 DEVIATION FROM STANDARD

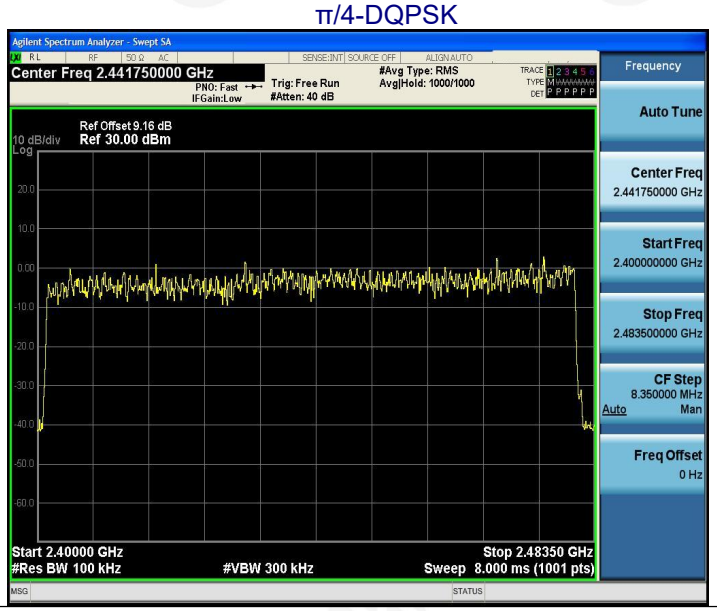
No deviation.

## 10.4 Test Result

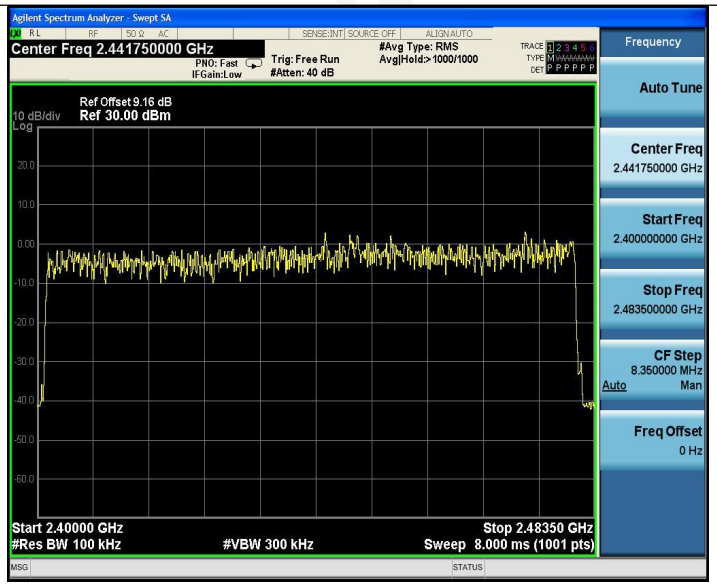
Test Plots:
79 Channels in total
GFSK



π/4-DQPSK




8-DPSK



## 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

GFSK mode:

| Frequency | Packet | Dwell time(ms) | Limit(ms) | Result |
|---|---|---|---|---|
| 2441MHz | DH1 | 124.48 | 400 | Pass |
| 2441MHz | DH3 | 263.04 | 400 | Pass |
| 2441MHz | DH5 | 308.48 | 400 | Pass |

Remarks:

The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s
Test channel: 2441MHz as blow
DH1 time slot=0.389(ms)*(1600/ (2*79))*31.6=124.48ms
DH3 time slot=1.644(ms)*(1600/ (4*79))*31.6=263.04ms
DH5 time slot=2.892(ms)*(1600/ (6*79))*31.6=308.48ms

π/4-DQPSK mode:

| Frequency | Packet | Dwell time(ms) | Limit(ms) | Result |
|---|---|---|---|---|
| 2441MHz | 2DH1 | 127.68 | 400 | Pass |
| 2441MHz | 2DH3 | 263.84 | 400 | Pass |
| 2441MHz | 2DH5 | 308.80 | 400 | Pass |

Remarks:

The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s
Test channel: 2441MHz as blow
DH1 time slot=0.399(ms)*(1600/ (2*79))*31.6=127.68ms
DH3 time slot=1.649(ms)*(1600/ (4*79))*31.6=263.84ms
DH5 time slot=2.895(ms)*(1600/ (6*79))*31.6=308.80ms

8-DPSK mode:

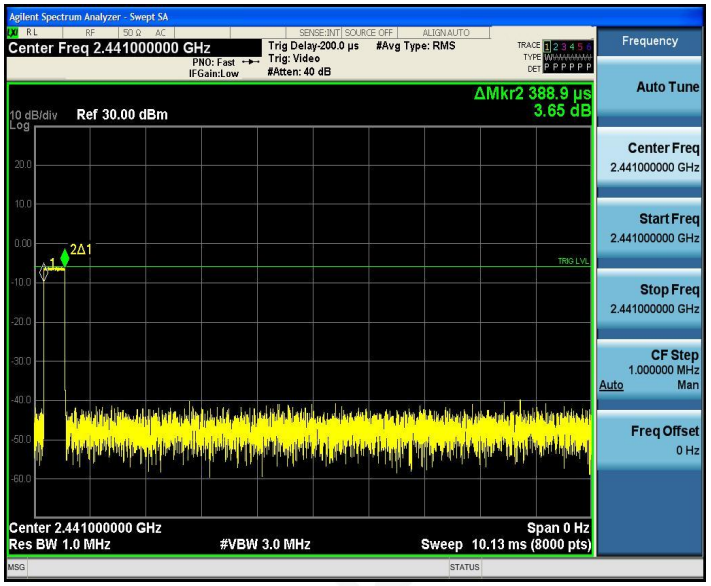
| Frequency | Packet | Dwell time(ms) | Limit(ms) | Result |
|---|---|---|---|---|
| 2441MHz | 3DH1 | 127.36 | 400 | Pass |
| 2441MHz | 3DH3 | 263.20 | 400 | Pass |
| 2441MHz | 3DH5 | 309.33 | 400 | Pass |

Remarks:

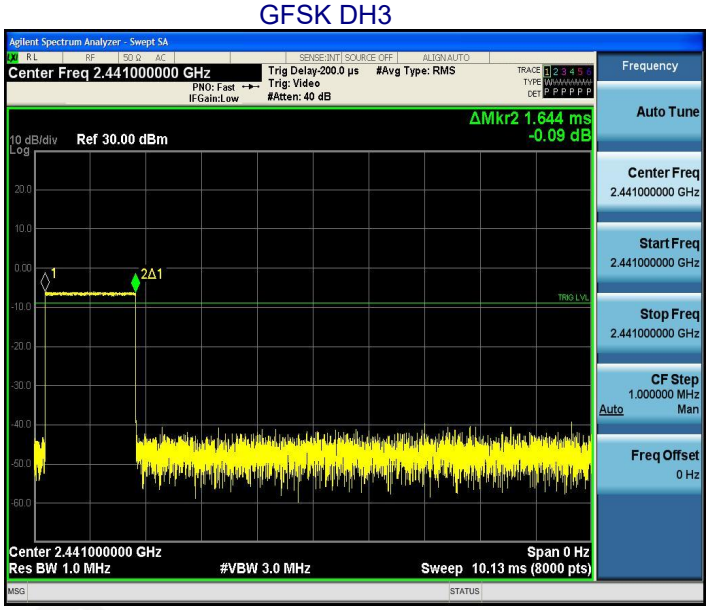
The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s
Test channel: 2441MHz as blow
DH1 time slot=0.398(ms)*(1600/ (2*79))*31.6=127.36ms
DH3 time slot=1.645(ms)*(1600/ (4*79))*31.6=263.20ms
DH5 time slot=2.900(ms)*(1600/ (6*79))*31.6=309.33ms

## Test Plots

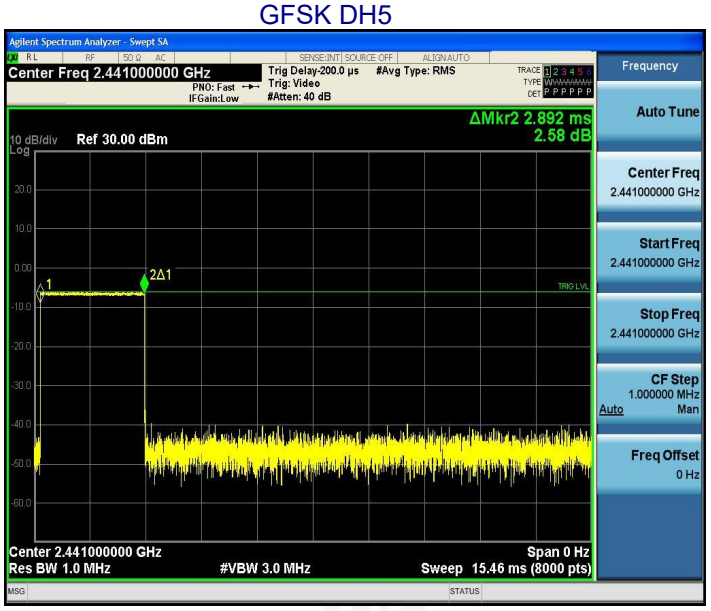
### GFSK DH1



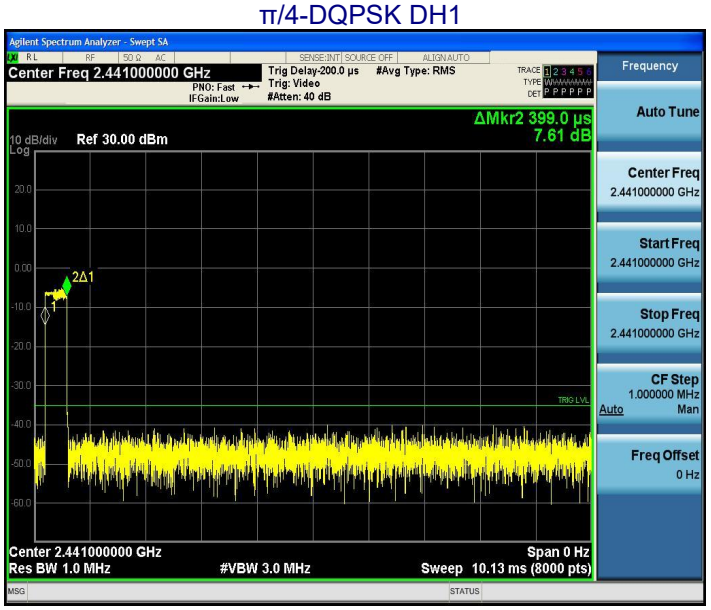

### GFSK DH3



GFSK DH5

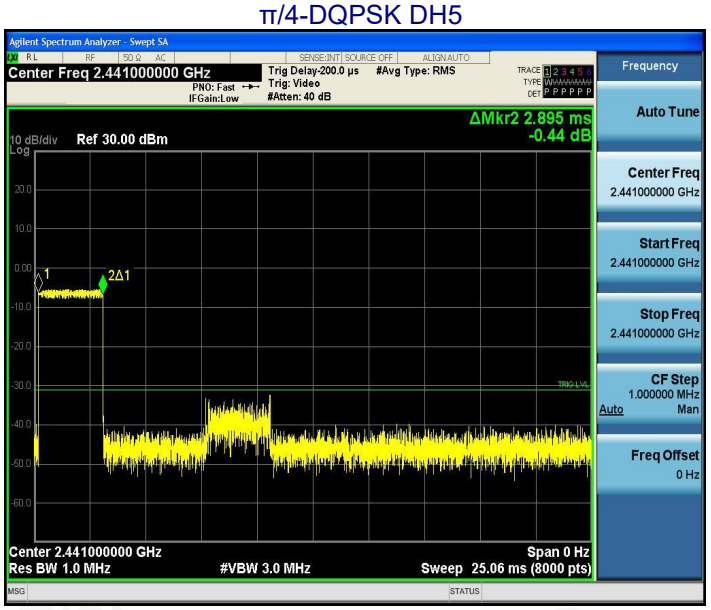



π/4-DQPSK DH1

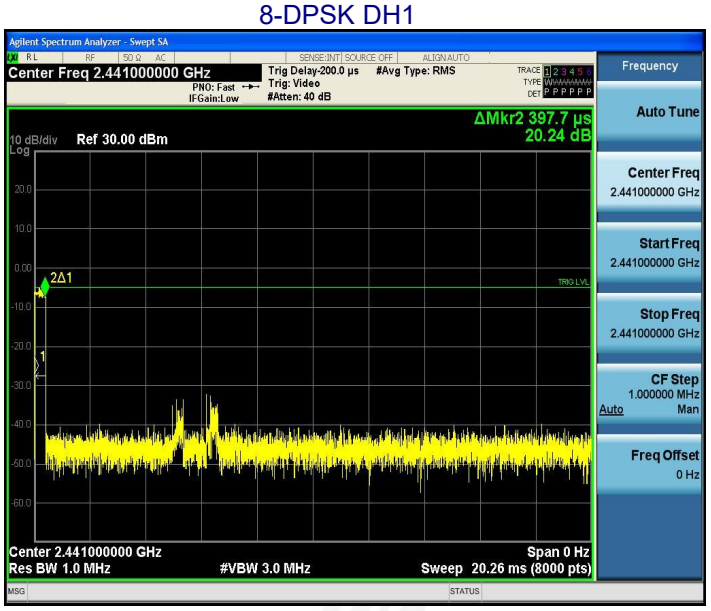


π/4-DQPSK DH3

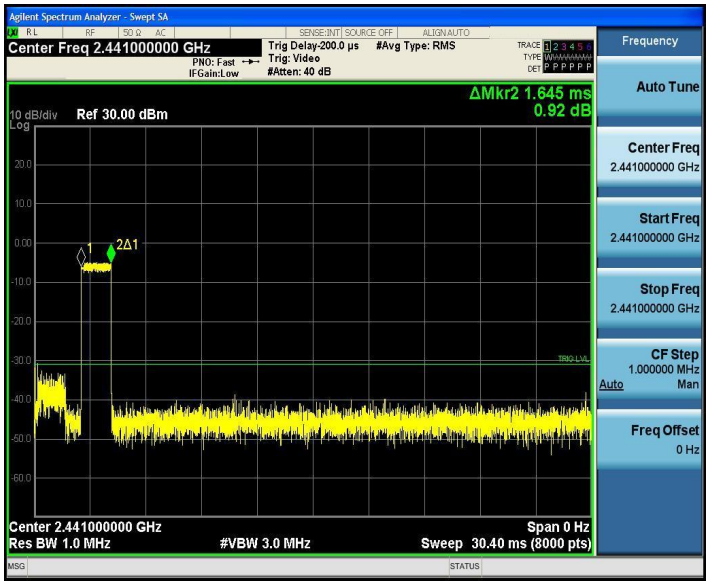
π/4-DQPSK DH5



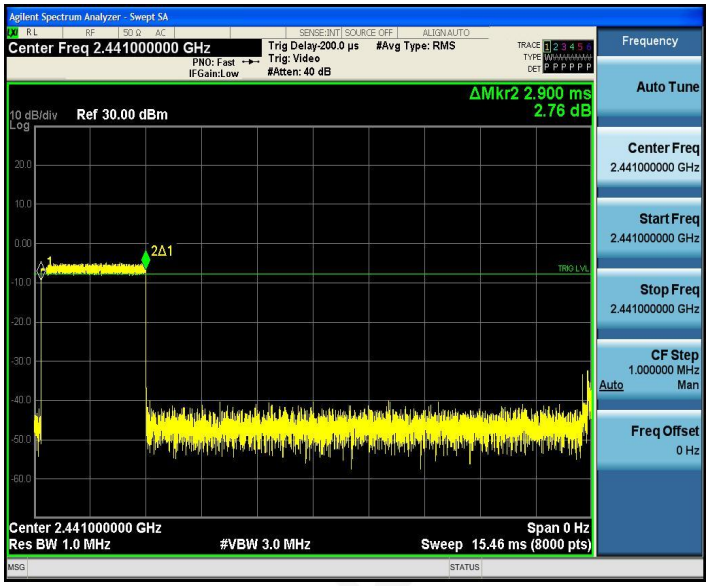
8-DPSK DH1




8-DPSK DH3



8-DPSK DH5


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.441000000 GHz
PNO: Fast
IFGain:Low
Trig Delay-200.0 µs
Trig: Video
#Avg Type: RMS
#Atten: 40 dB
ΔMkr2 2.900 ms
2.76 dB
10 dB/div
Log
Ref 30.00 dBm
2Δ1
Center 2.441000000 GHz
Res BW 1.0 MHz
#VBW 3.0 MHz
Span 0 Hz
Sweep 15.46 ms (8000 pts)
Frequency
Auto Tune
Center Freq
2.441000000 GHz
Start Freq
2.441000000 GHz
Stop Freq
2.441000000 GHz
CF Step
1.000000 MHz
Auto
Man
Freq Offset
0 Hz

## 12. Antenna Requirement

| Standard requirement: | FCC Part15 C Section 15.203 /247(c) |
|---|---|
| 15.203 requirement:<br>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.<br>15.247(c) (1)(i) requirement:<br>(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi. | |
| EUT Antenna: | |
| The antenna is Ceramic antenna, the best case gain of the antennas is 0dBi, 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 ※※※※※**