## 5.4 20dB Bandwidth

**Limit**

For frequency hopping systems operating in the 2400MHz-2483.5MHz no limit for 20dB bandwidth.

**Test Procedure**

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30 KHz RBW and 100 KHz VBW.

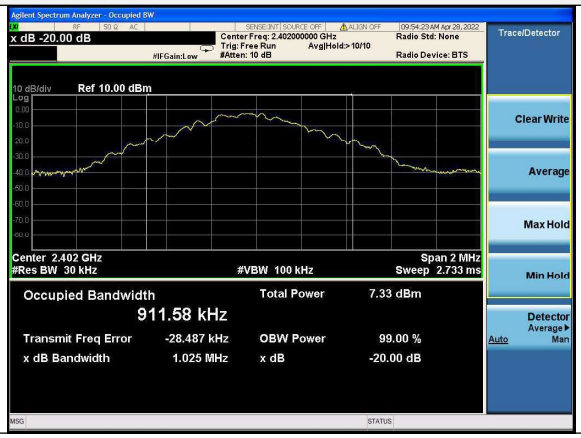
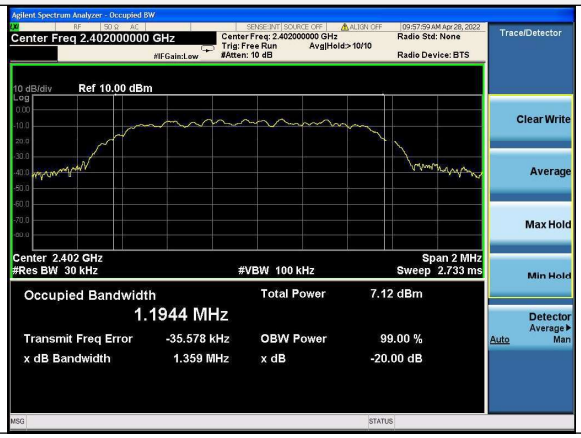
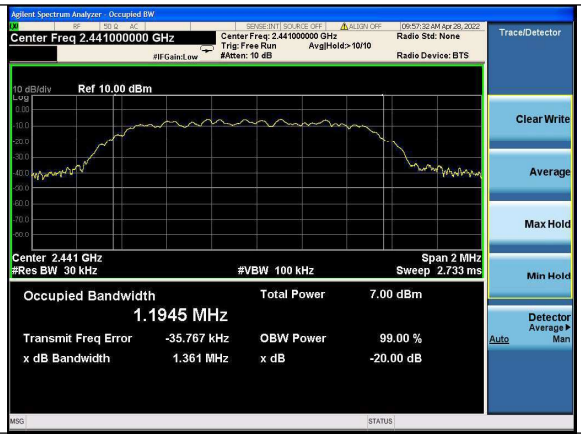
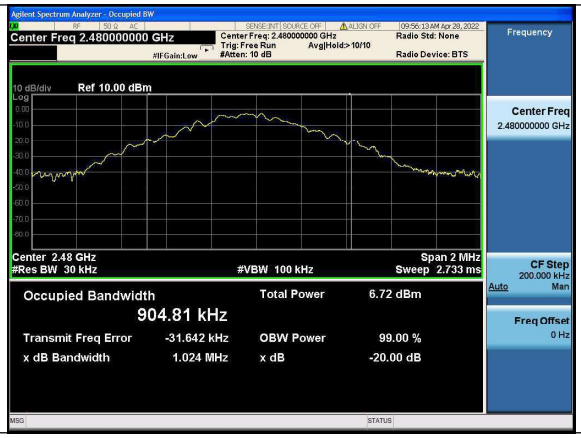
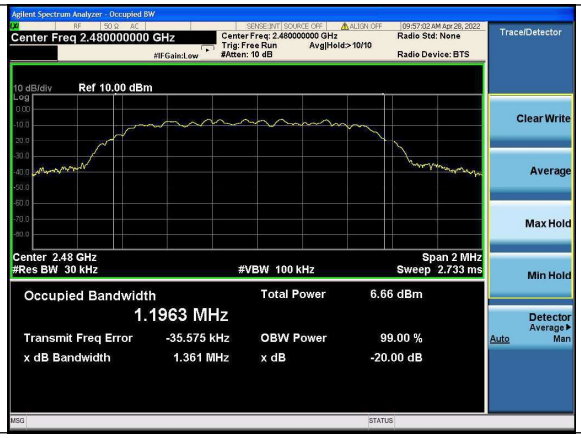
The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

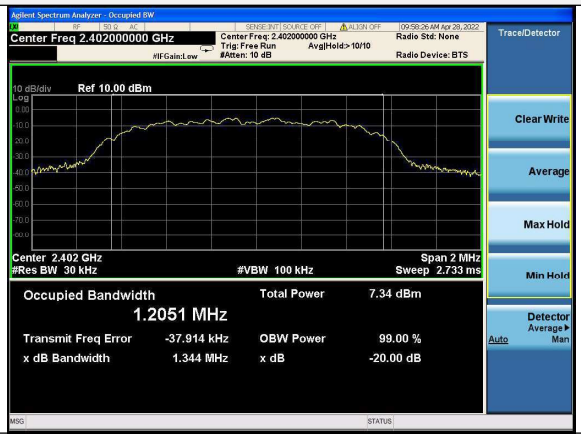
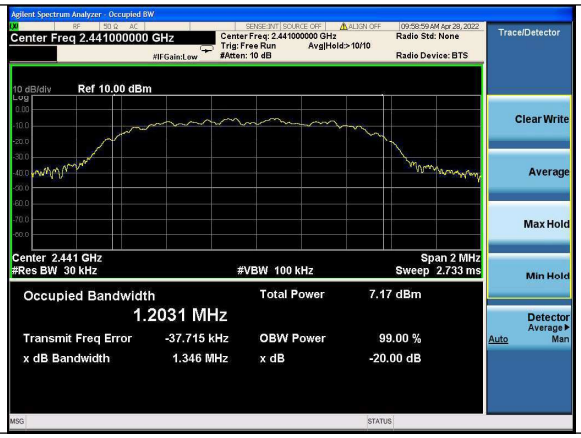
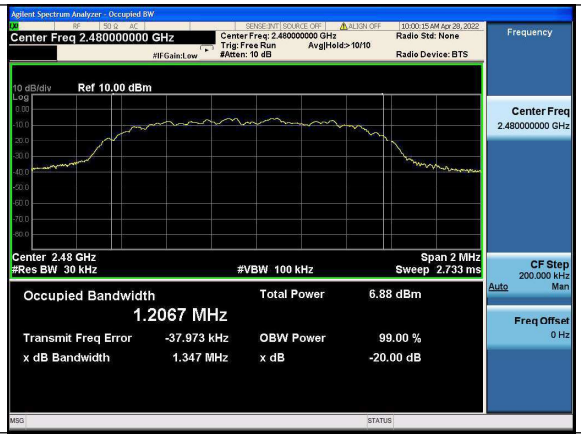
**Test Configuration**


**Test Results**

| Modulation | Channel | 20dB bandwidth (MHz) | Result |
|---|---|---|---|
| GFSK | CH00 | 1.025 | Pass |
| | CH39 | 1.027 | |
| | CH78 | 1.024 | |
| π/4DQPSK | CH00 | 1.359 | |
| | CH39 | 1.361 | |
| | CH78 | 1.361 | |
| 8DPSK | CH00 | 1.344 | |
| | CH39 | 1.346 | |
| | CH78 | 1.347 | |

**Test plot as follows:**

| *GFSK Modulation* | *π/4DQPSK Modulation* |
|---|---|
|  |  |
| *CH00* | |
|  |  |
| *CH39* | |
|  |  |
| *CH78* | |

| *8DPSK Modulation* | |
|---|---|
|  | |
| *CH00* | |
|  | |
| *CH39* | |
|  | |
| *CH78* | |

## 5.5 Frequency Separation

**LIMIT**

According to 15.247(a)(1),frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

**TEST PROCEDURE**

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with100 KHz RBW and 300 KHz VBW.

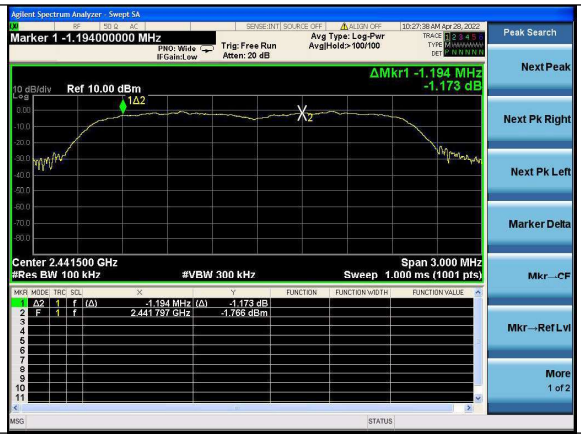
**TEST CONFIGURATION**

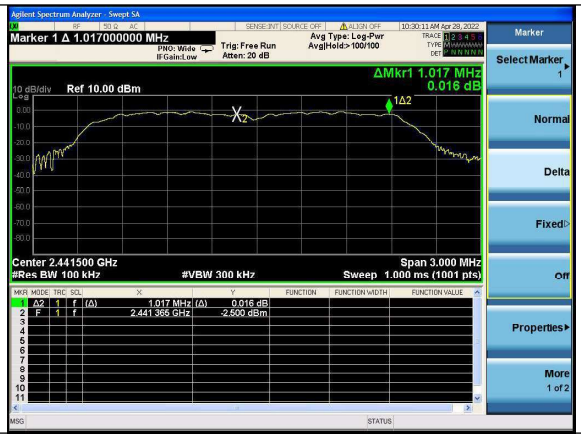

**TEST RESULTS**

| Modulation | Channel | Channel Separation (MHz) | Limit(MHz) (2/3*20dB bandwidth) | Limit | Result |
|---|---|---|---|---|---|
| GFSK | CH00 | 0.999 | 0.683 | 25KHz | Pass |
| | CH39 | 1.008 | 0.685 | | |
| | CH78 | 0.999 | 0.683 | | |
| π/4DQPSK | CH00 | 1.203 | 0.906 | 25KHz | Pass |
| | CH39 | 1.194 | 0.907 | | |
| | CH78 | 1.128 | 0.907 | | |
| 8DPSK | CH00 | 1.011 | 0.896 | 25KHz | Pass |
| | CH39 | 1.017 | 0.897 | | |
| | CH78 | 1.038 | 0.898 | | |

Note:
We have tested all mode at high, middle and low g..channel, and recorded worst case at middle

**Test plot as follows:**

| *GFSK Modulation* | *π/4DQPSK Modulation* |
|---|---|
|  |  |
| *CH00* | |
|  |  |
| *CH39* | |
|  |  |
| *CH78* | |

| *8DPSK Modulation* | |
|---|---|
|  | |
| *CH00* | |
|  | |
| *CH39* | |
|  | |
| *CH78* | |

## 5.6 Number of hopping frequency

**Limit**

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

**Test Procedure**

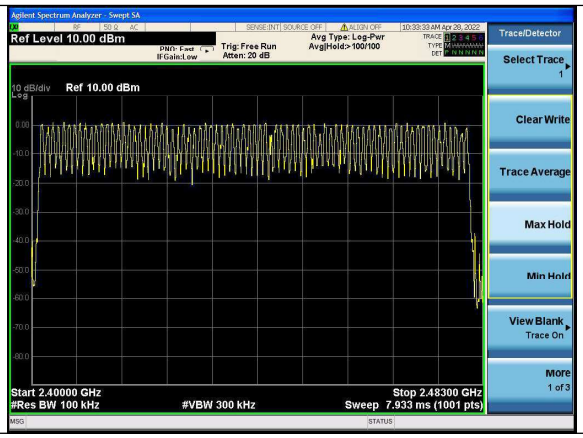
The transmitter output was connected to the spectrum analyzer through an attenuator. Set spectrum analyzer start 2400MHz to 2483.5MHz with 100 KHz RBW and 300 KHz VBW.

**Test Configuration**

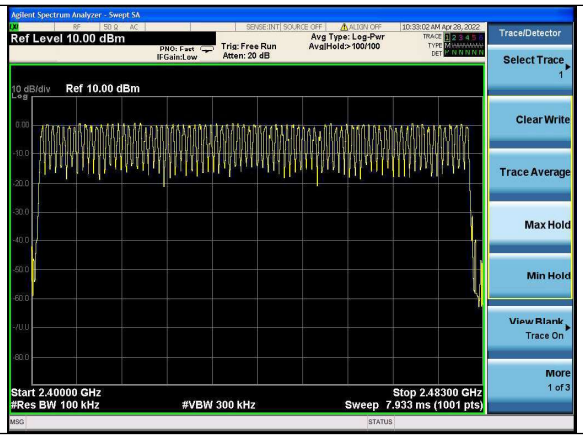

**Test Results**

| Modulation | Number of Hopping Channel | Limit | Result |
|---|---|---|---|
| GFSK | 79 | ≥15 | Pass |
| π/4DQPSK | 79 | | |
| 8DPSK | 79 | | |

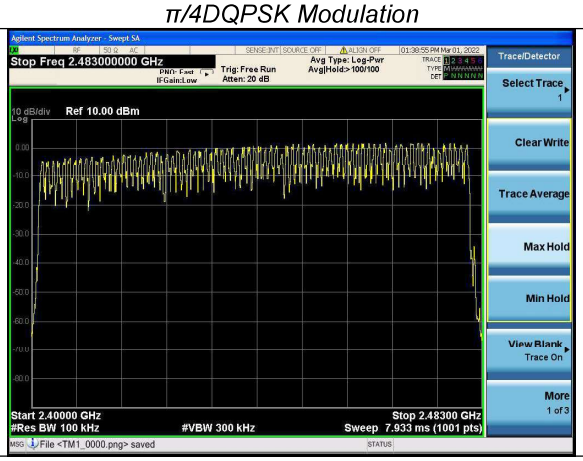
**Test plot as follows:**




*GFSK Modulation*




*π/4DQPSK Modulation*




*8DPSK Modulation*

## 5.7 Time of Occupancy (Dwell Time)

**Limit**

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

**Test Procedure**

The transmitter output was connected to the spectrum analyzer through an attenuator. Set center frequency of spectrum analyzer=operating frequency with 1MHz RBW and 1MHz VBW, Span 0Hz.

**Test Configuration**


**Test Results**

| Modulation | Packet | Burst time (ms) | Dwell time (s) | Limit (s) | Result |
|---|---|---|---|---|---|
| GFSK | DH1 | 0.410 | 0.131 | 0.40 | Pass |
| | DH3 | 1.670 | 0.267 | | |
| | DH5 | 2.930 | 0.314 | | |
| π/4DQPSK | 2-DH1 | 0.380 | 0.122 | 0.40 | Pass |
| | 2-DH3 | 1.650 | 0.264 | | |
| | 2-DH5 | 2.920 | 0.312 | | |
| 8DPSK | 3-DH1 | 0.400 | 0.128 | 0.40 | Pass |
| | 3-DH3 | 1.650 | 0.264 | | |
| | 3-DH5 | 2.935 | 0.314 | | |

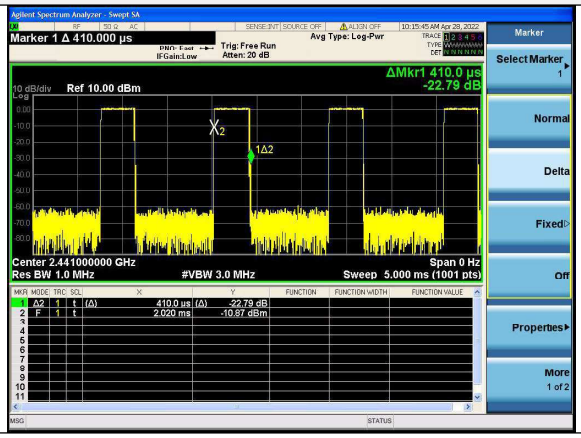
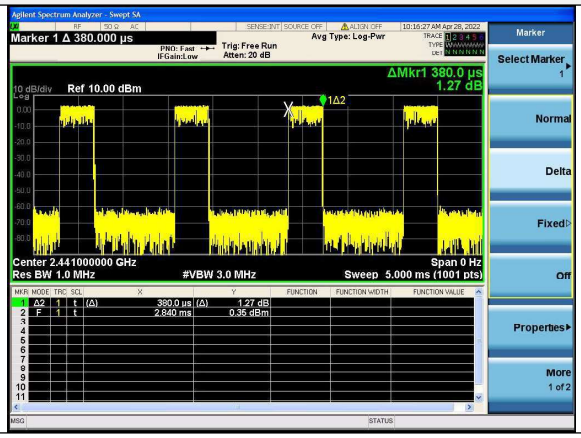
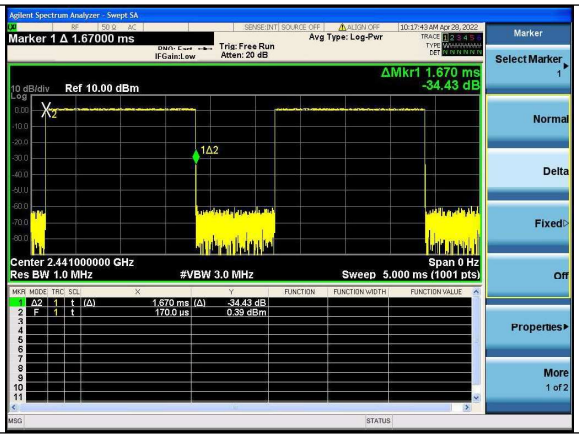
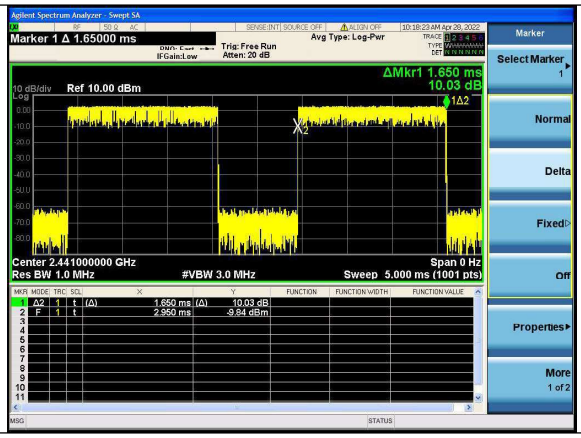
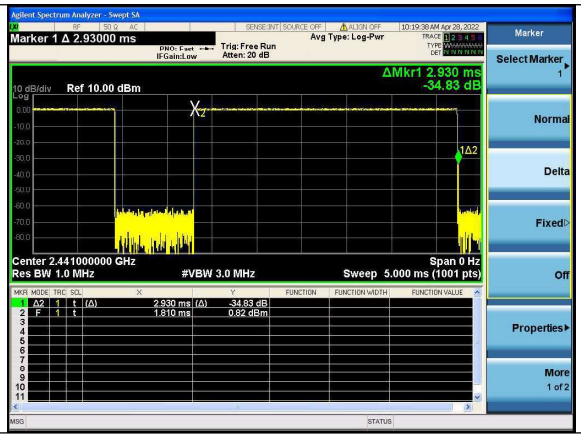
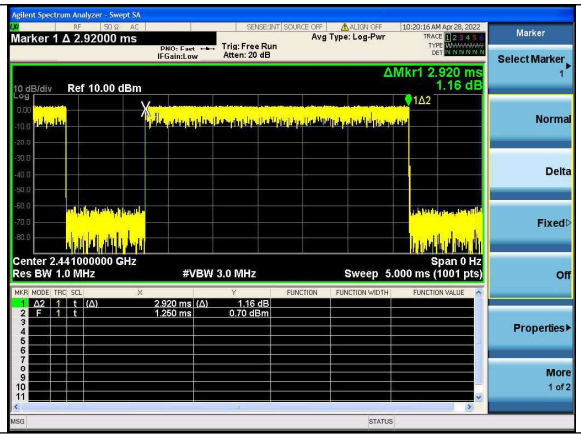
Note:We have tested all mode at high,middle and low channel,and recoreded worst case at middle channel.

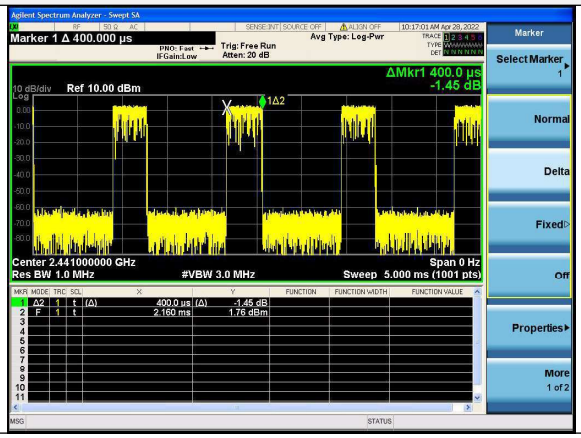
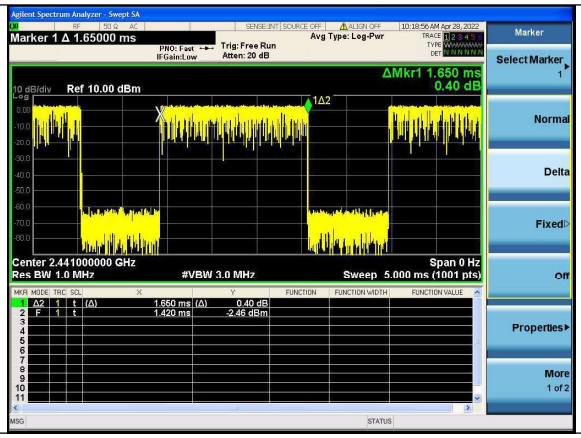
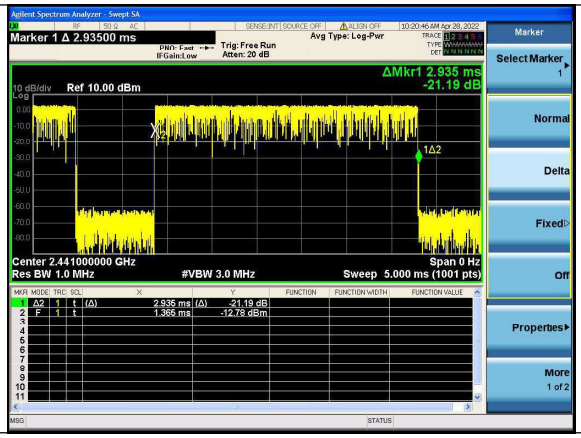
Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second for DH1, 2-DH1, 3-DH1

Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second for DH3, 2-DH3, 3-DH3

Dwell time=Pulse time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second for DH5, 2-DH5, 3-DH5

**Test plot as follows:**

| *GFSK Modulation* | *π/4DQPSK Modulation* |
|---|---|
|  |  |
| *CH00* | |
|  |  |
| *CH39* | |
|  |  |
| *CH78* | |

| *8DPSK Modulation* | |
|---|---|
|  | |
| *CH00* | |
|  | |
| *CH39* | |
|  | |
| *CH78* | |

## 5.8 Spurious RF Conducted Emission

**TEST CONFIGURATION**


**TEST PROCEDURE**

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100kHz and VBW= 300KHz to measure the peak field strength , and mwasure frequeny range from 9KHz to 25GHz.

**LIMIT**

1. Below -20dB of the highest emission level in operating band.
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

Test plot as follows: