

## 4.5 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  $\frac{2}{3} \times 20\text{dB}$  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 with 100 KHz RBW and 300 KHz VBW.

### TEST CONFIGURATION



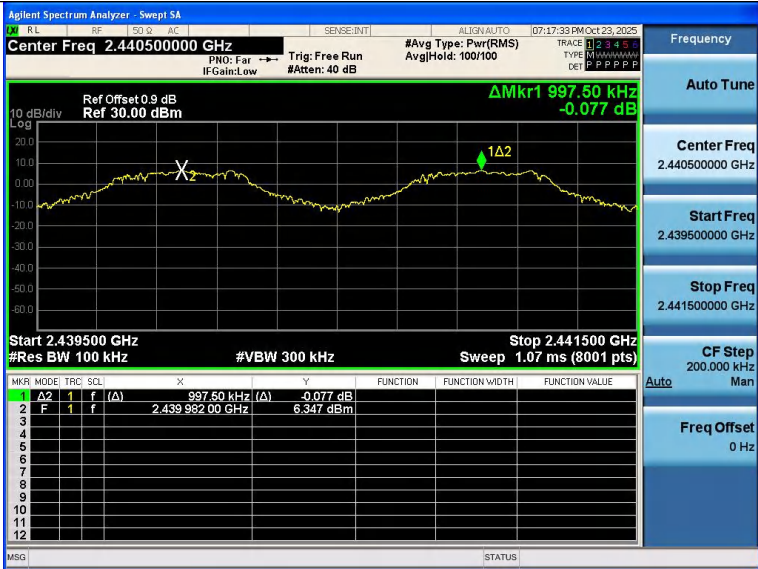
### TEST RESULTS

| Modulation    | Channel | Channel Separation (MHz) | Limit(MHz) | Result |
|---------------|---------|--------------------------|------------|--------|
| GFSK          | CH39    | 0.997                    | 0.637      | Pass   |
|               | CH40    |                          |            |        |
| $\pi/4$ DQPSK | CH39    | 0.860                    | 0.877      | Pass   |
|               | CH40    |                          |            |        |
| 8DPSK         | CH39    | 0.999                    | 0.857      | Pass   |
|               | CH40    |                          |            |        |

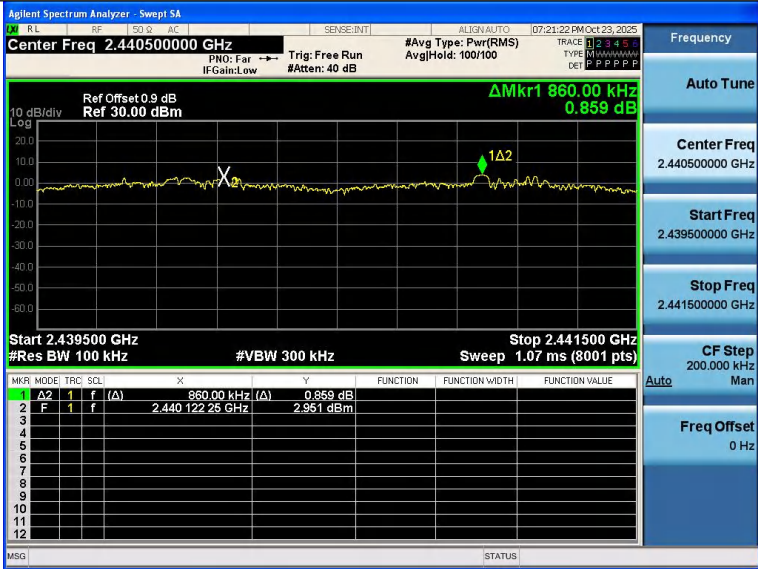
Note:

We have tested all mode at high, middle and low channel, and recorded worst case at middle

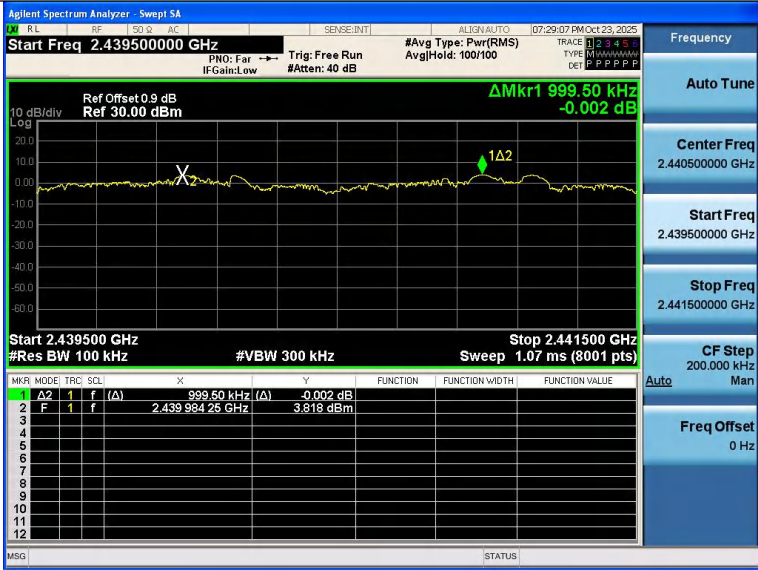
**Test plot as follows:**



GFSK



8DPSK



$\pi/4$ DQPSK

#### 4.6 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.

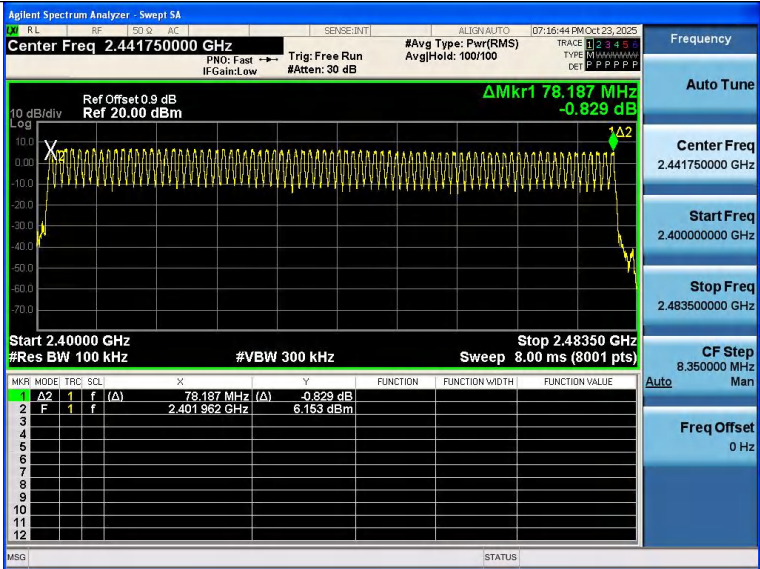
##### Test Configuration



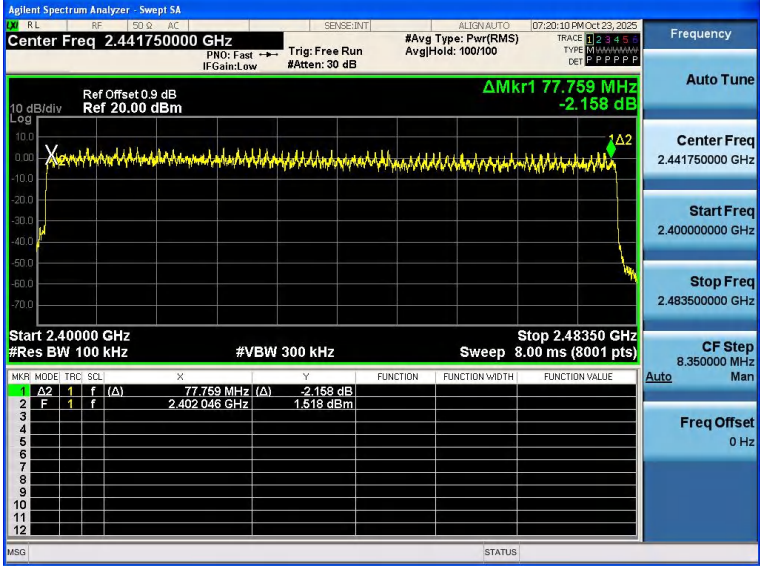
##### Test Results

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

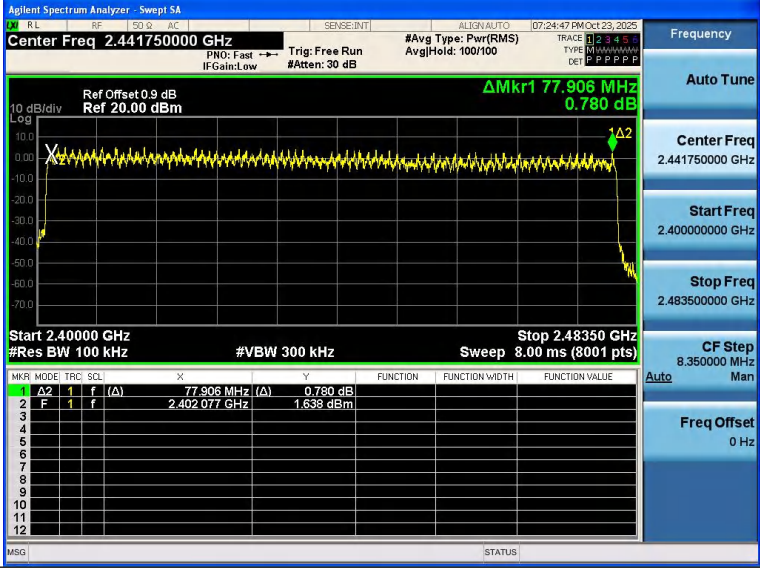
##### Test plot as follows:



GFSK Modulation



π/4DQPSK Modulation



8DPSK Modulation

## 4.7 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

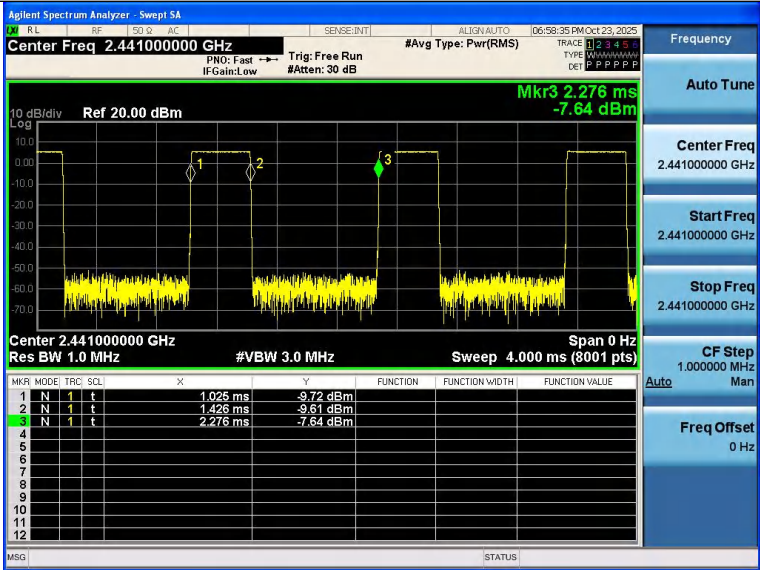
| Modulation | Packet | Pulse time (ms) | Dwell time (s) | Limit (s) | Result |
|------------|--------|-----------------|----------------|-----------|--------|
| GFSK       | DH1    | 0.401           | 0.128          | 0.40      | Pass   |
|            | DH3    | 1.656           | 0.265          |           |        |
|            | DH5    | 2.903           | 0.310          |           |        |
| π/4DQPSK   | 2-DH1  | 0.414           | 0.132          | 0.40      | Pass   |
|            | 2-DH3  | 1.664           | 0.266          |           |        |
|            | 2-DH5  | 2.912           | 0.311          |           |        |
| 8DPSK      | 3-DH1  | 0.413           | 0.132          | 0.40      | Pass   |
|            | 3-DH3  | 1.662           | 0.266          |           |        |
|            | 3-DH5  | 2.912           | 0.311          |           |        |

Note:

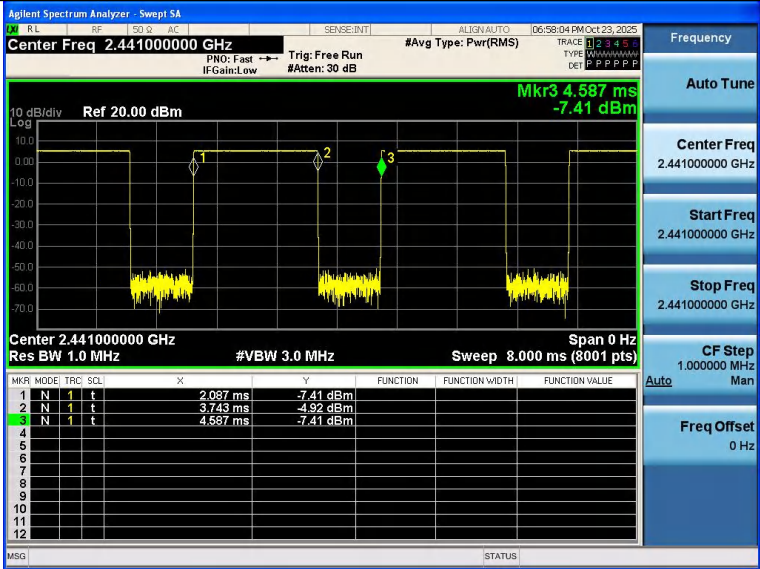
- We have tested all mode at high,middle and low channel,and recoreded worst case at middle channel.
- $\text{Dwell time} = \text{Pulse time (ms)} \times (1600 \div 2 \div 79) \times 31.6$  Second for DH1, 2-DH1, 3-DH1  
 $\text{Dwell time} = \text{Pulse time (ms)} \times (1600 \div 4 \div 79) \times 31.6$  Second for DH3, 2-DH3, 3-DH3  
 $\text{Dwell time} = \text{Pulse time (ms)} \times (1600 \div 6 \div 79) \times 31.6$  Second for DH5, 2-DH5, 3-DH5

### Test plot as follows:

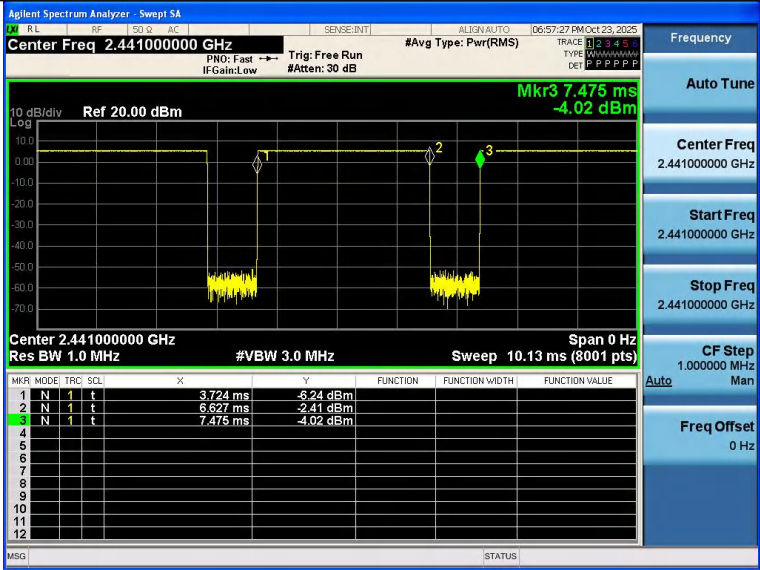
GFSK Modulation



DH1

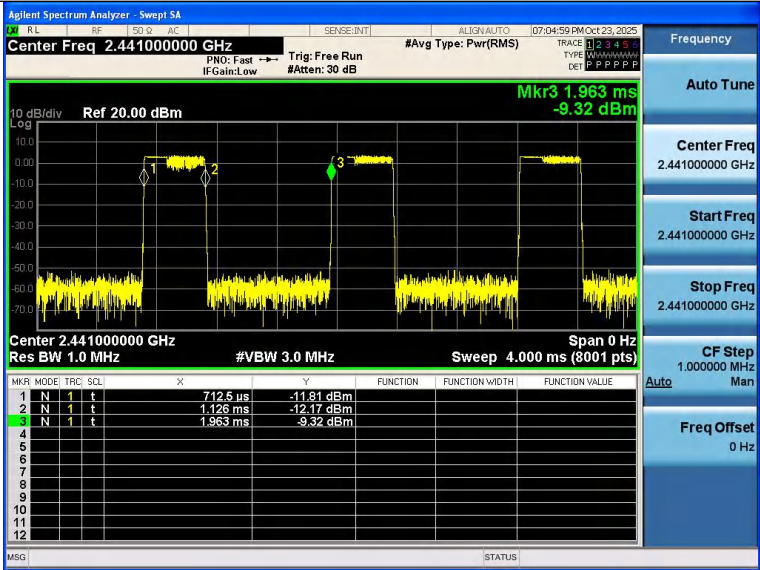


DH3

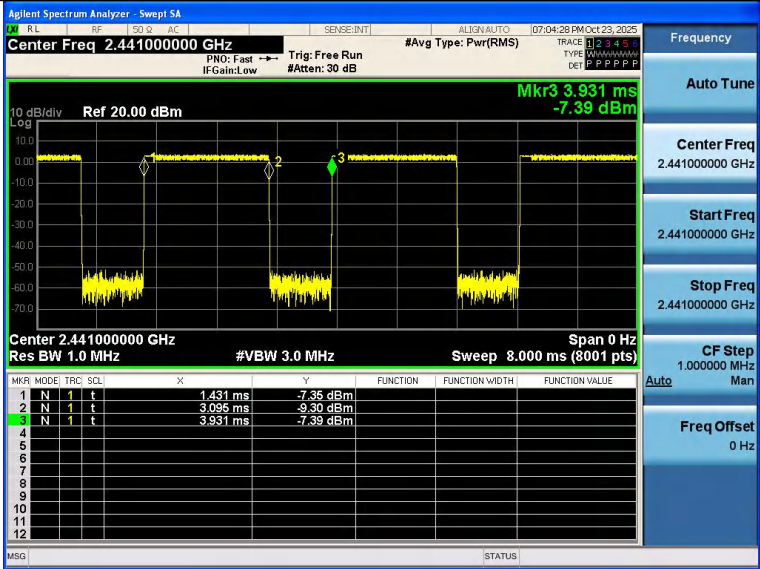


DH5

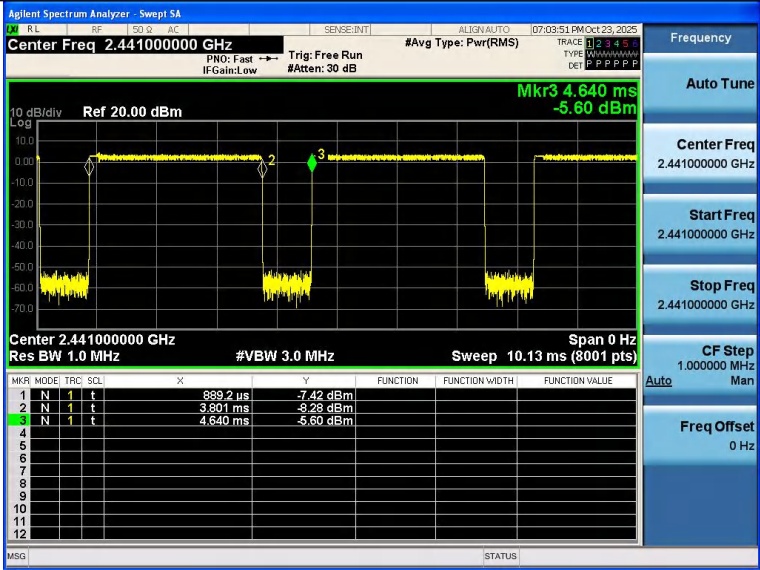
$\pi/4$ DQPSK Modulation



2-DH1

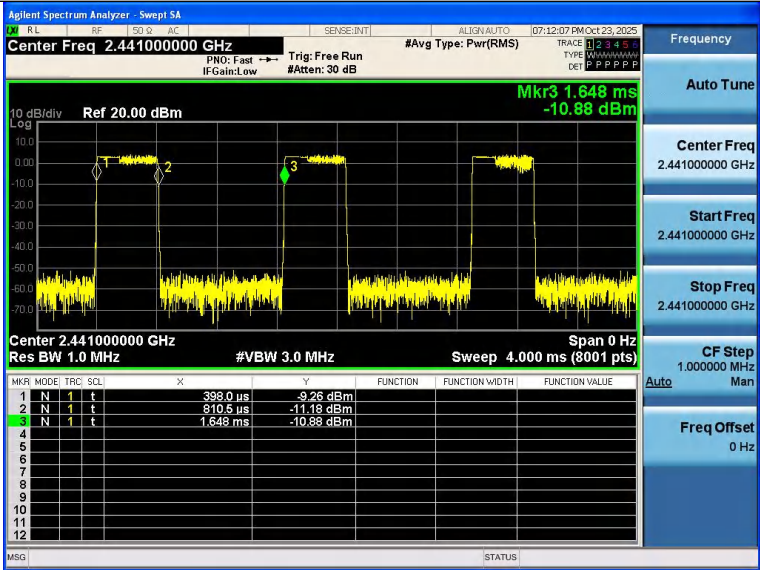


2-DH3

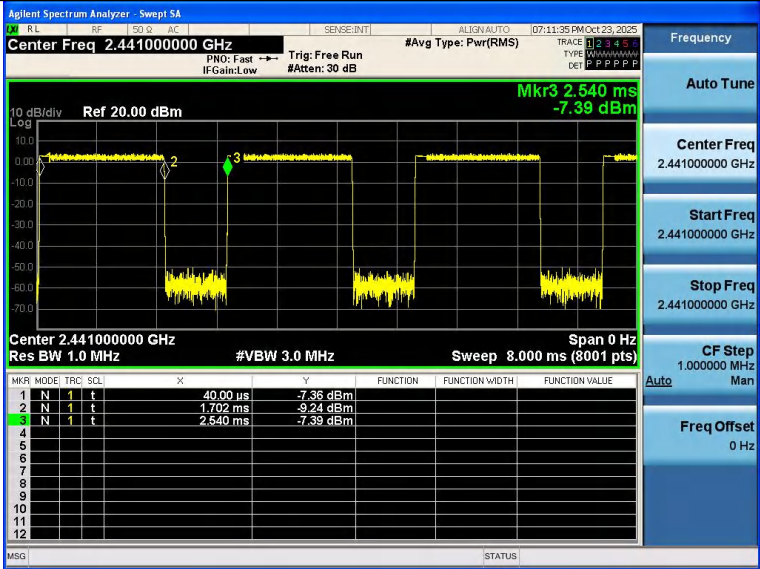


2-DH5

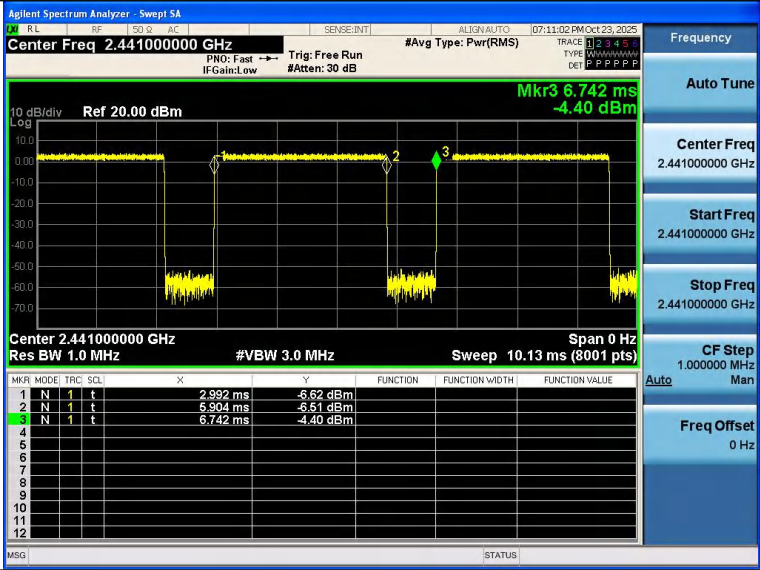
8DPSK Modulation



3-DH1



3-DH3



3-DH5