



Shenzhen CTL Testing Technology Co., Ltd.

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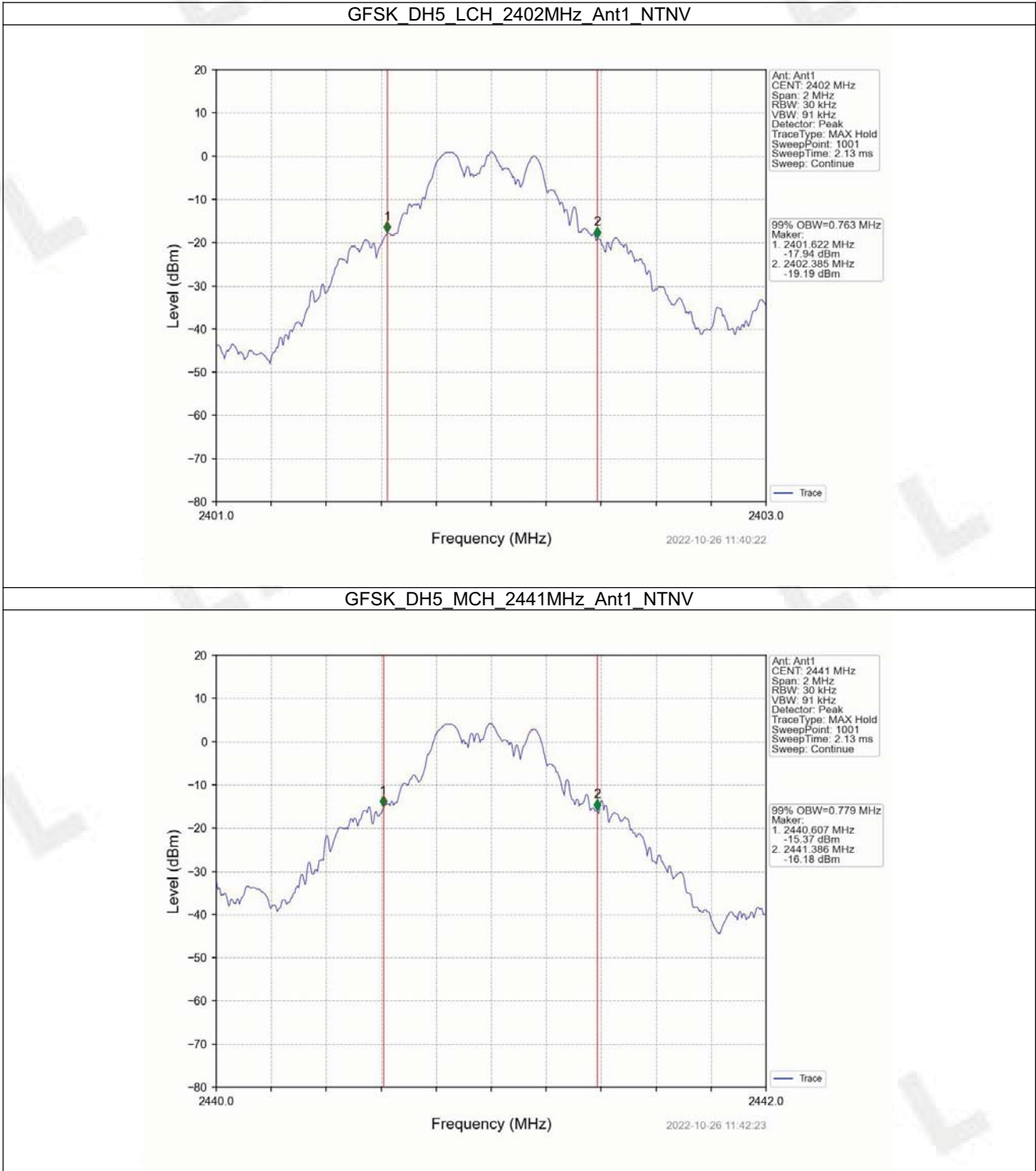
## 1. Bandwidth

### 1.1 OBW

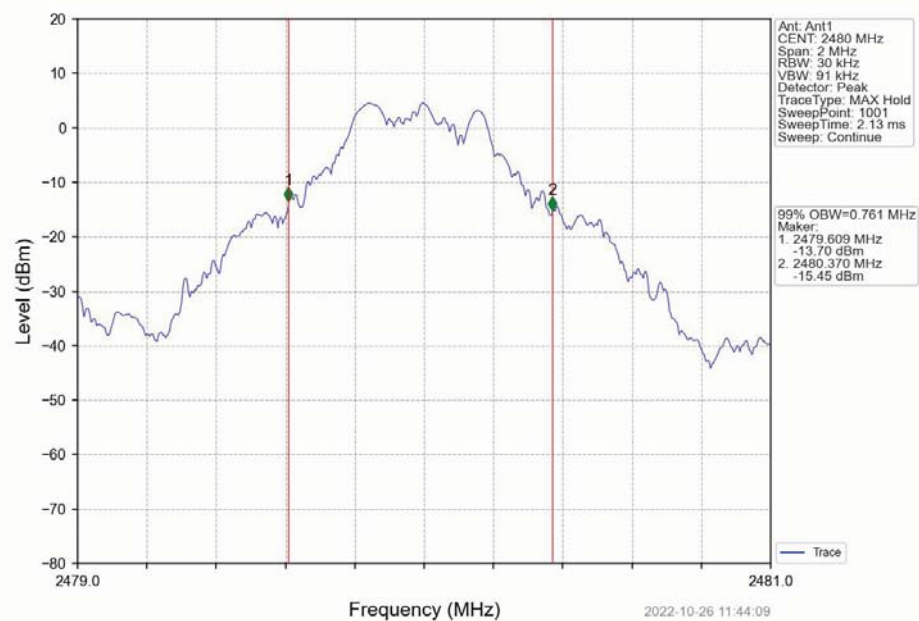
#### 1.1.1 Test Result

| Mode      | TX Type | Frequency (MHz) | Packet Type | ANT | 99% Occupied Bandwidth (MHz) | Verdict |
|-----------|---------|-----------------|-------------|-----|------------------------------|---------|
|           |         |                 |             |     | Result                       |         |
| GFSK      | SISO    | 2402            | DH5         | 1   | 0.763                        | Pass    |
|           |         | 2441            | DH5         | 1   | 0.779                        | Pass    |
|           |         | 2480            | DH5         | 1   | 0.761                        | Pass    |
| Pi/4DQPSK | SISO    | 2402            | 2DH5        | 1   | 1.121                        | Pass    |
|           |         | 2441            | 2DH5        | 1   | 1.122                        | Pass    |
|           |         | 2480            | 2DH5        | 1   | 1.120                        | Pass    |
| 8DPSK     | SISO    | 2402            | 3DH5        | 1   | 1.082                        | Pass    |
|           |         | 2441            | 3DH5        | 1   | 1.080                        | Pass    |
|           |         | 2480            | 3DH5        | 1   | 1.076                        | Pass    |

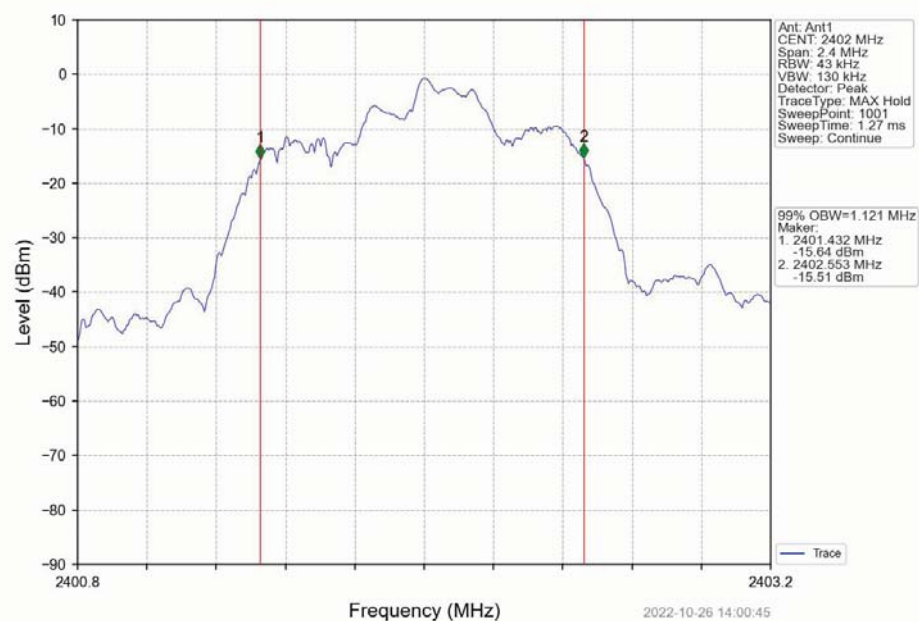
1.1.2 Test Graph



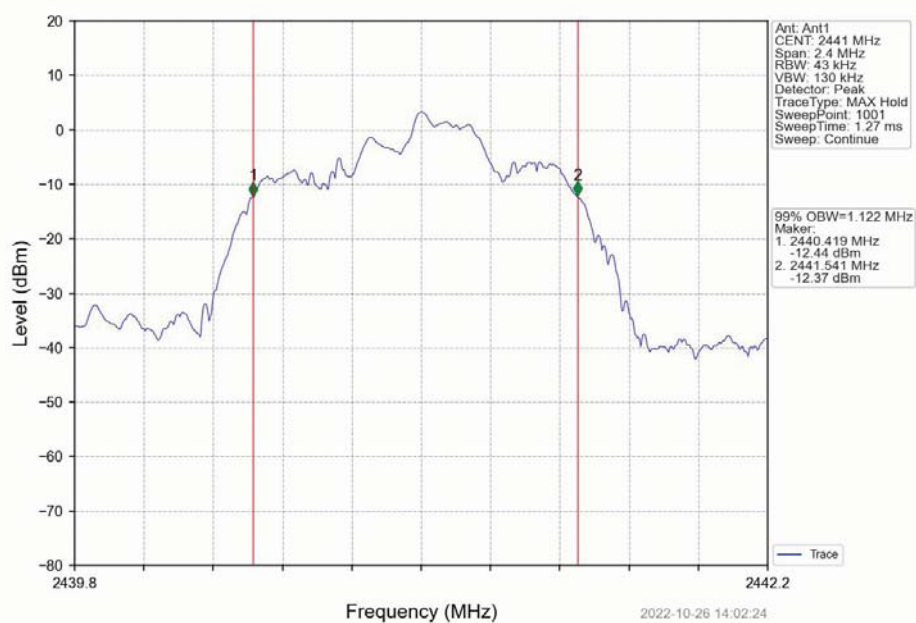
GFSK\_DH5\_HCH\_2480MHz\_Ant1\_NTNV



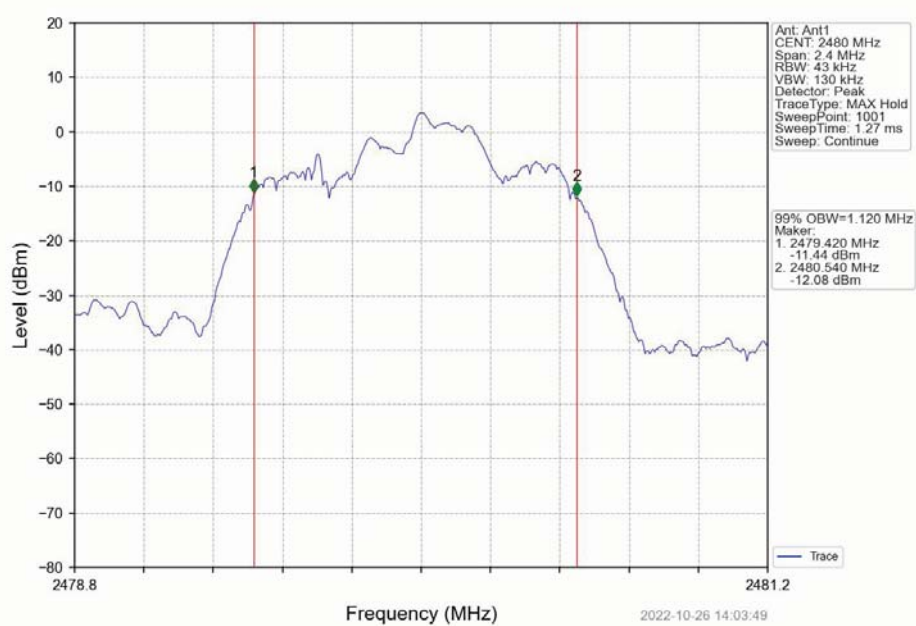
Pi/4DQPSK\_2DH5\_LCH\_2402MHz\_Ant1\_NTNV



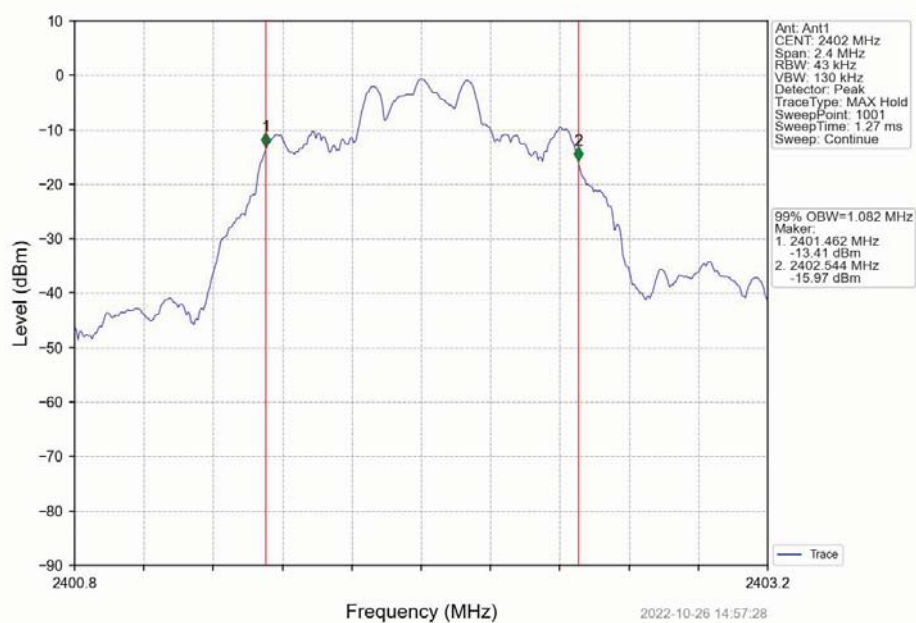
Pi/4DQPSK\_2DH5\_MCH\_2441MHz\_Ant1\_NTNV



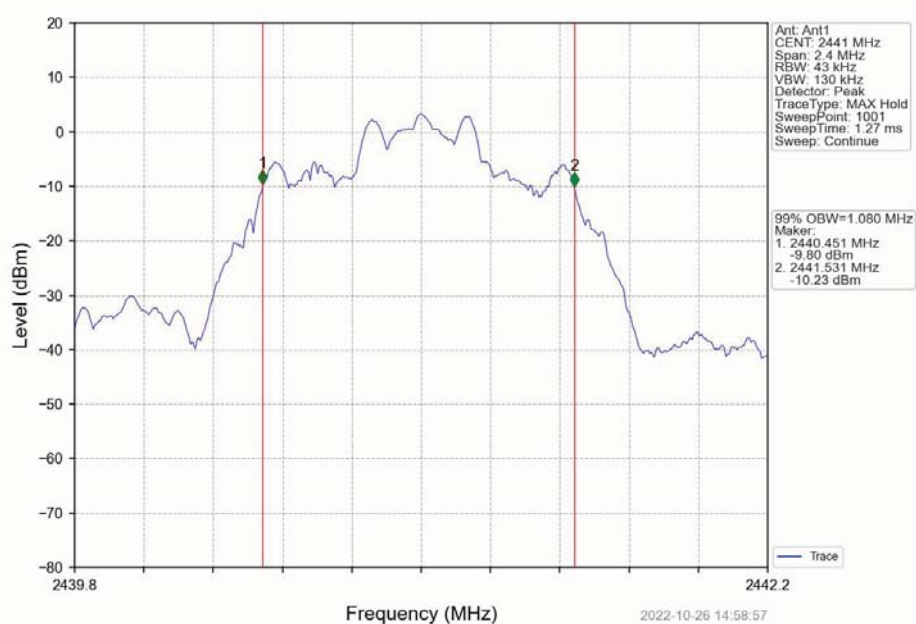
Pi/4DQPSK\_2DH5\_HCH\_2480MHz\_Ant1\_NTNV

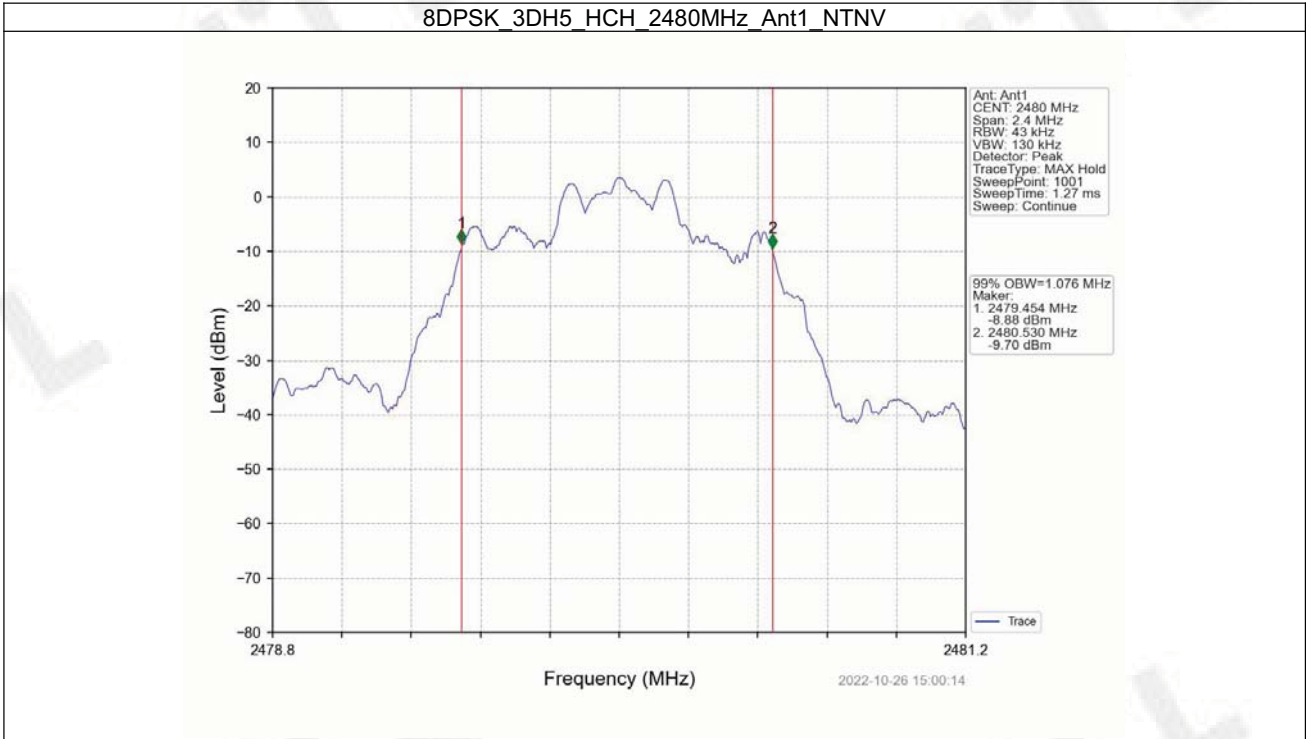


8DPSK\_3DH5\_LCH\_2402MHz\_Ant1\_NTNV



8DPSK\_3DH5\_MCH\_2441MHz\_Ant1\_NTNV



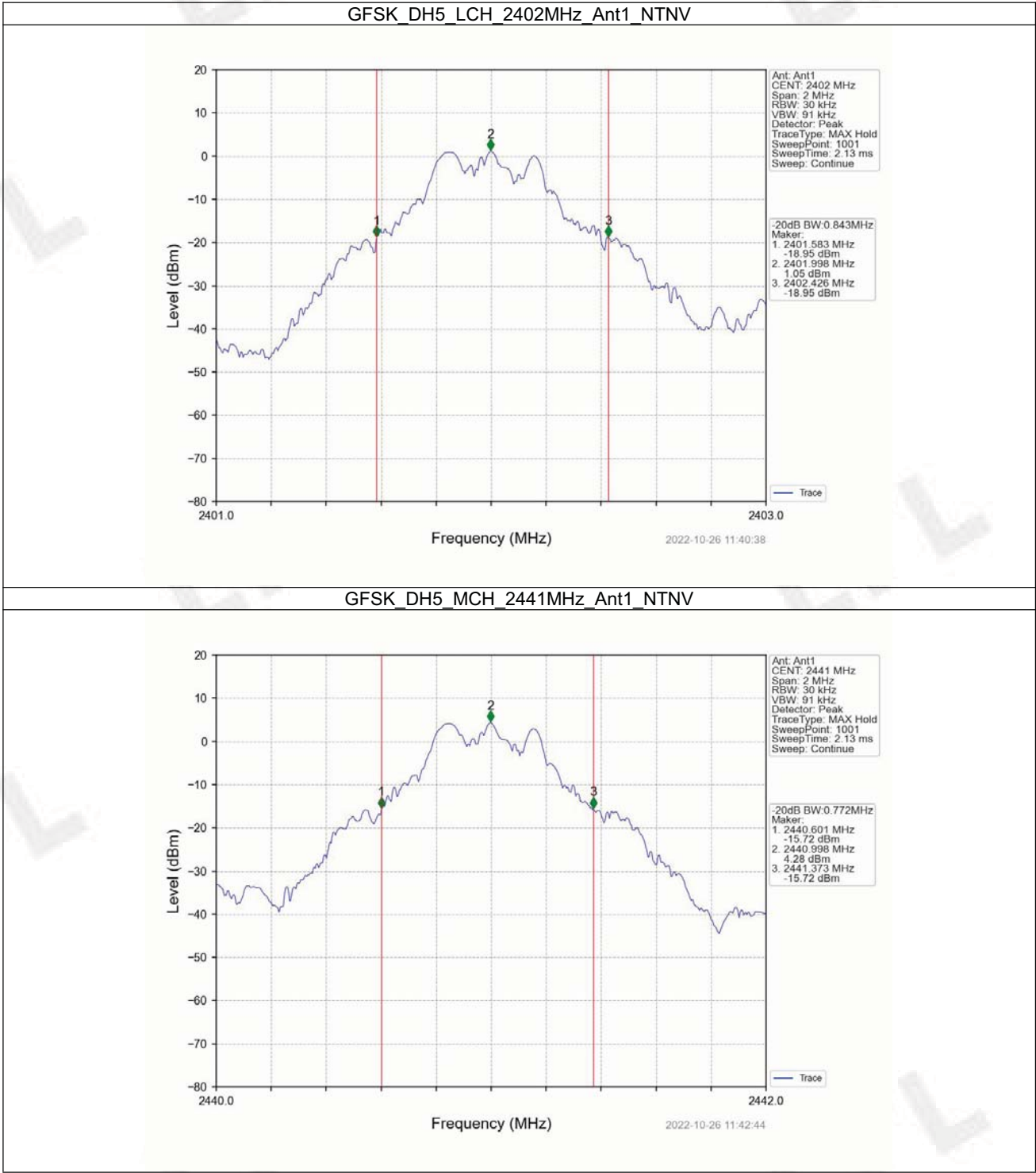


## 1.2 20dB BW

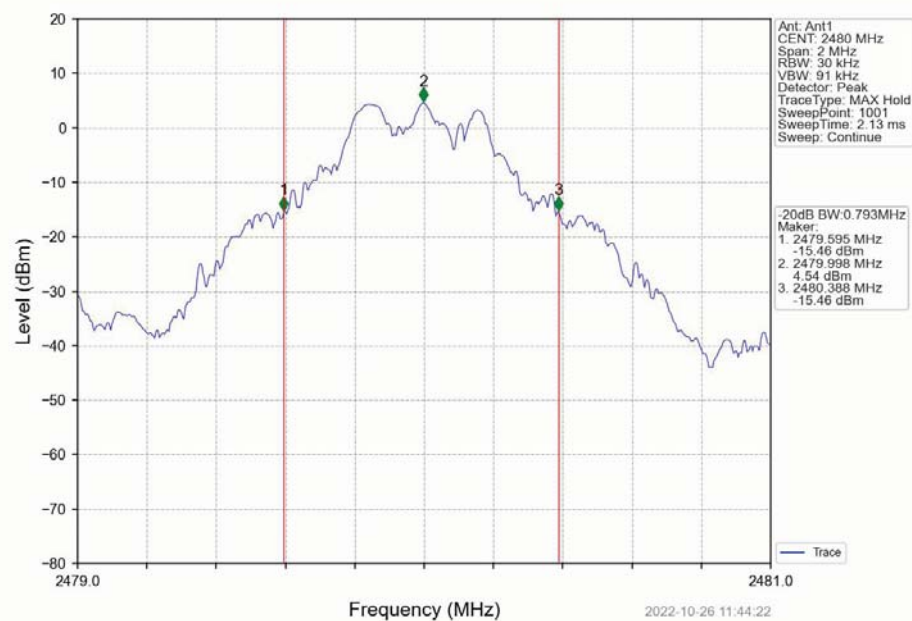
## 1.2.1 Test Result

| Mode      | TX Type | Frequency (MHz) | Packet Type | ANT | 20dB Bandwidth (MHz) | Verdict |
|-----------|---------|-----------------|-------------|-----|----------------------|---------|
|           |         |                 |             |     | Result               |         |
| GFSK      | SISO    | 2402            | DH5         | 1   | 0.843                | Pass    |
|           |         | 2441            | DH5         | 1   | 0.772                | Pass    |
|           |         | 2480            | DH5         | 1   | 0.793                | Pass    |
| Pi/4DQPSK | SISO    | 2402            | 2DH5        | 1   | 1.216                | Pass    |
|           |         | 2441            | 2DH5        | 1   | 1.216                | Pass    |
|           |         | 2480            | 2DH5        | 1   | 1.212                | Pass    |
| 8DPSK     | SISO    | 2402            | 3DH5        | 1   | 1.175                | Pass    |
|           |         | 2441            | 3DH5        | 1   | 1.163                | Pass    |
|           |         | 2480            | 3DH5        | 1   | 1.152                | Pass    |

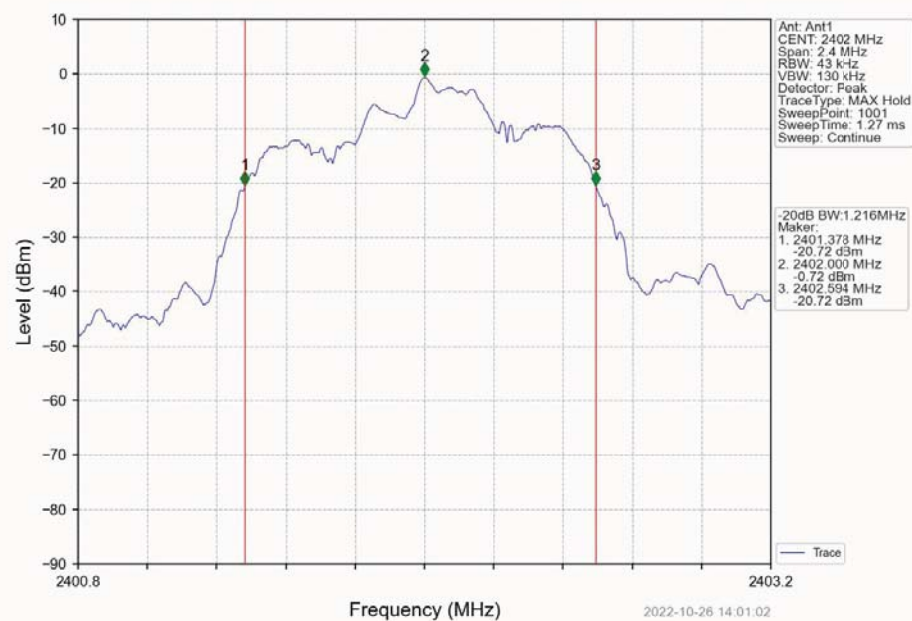
1.2.2 Test Graph



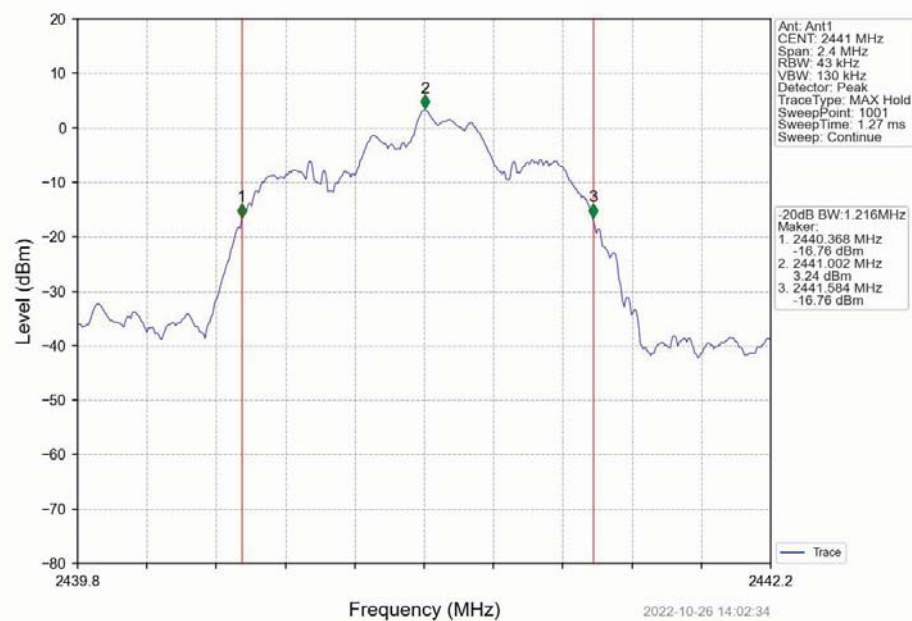
GFSK\_DH5\_HCH\_2480MHz\_Ant1\_NTNV



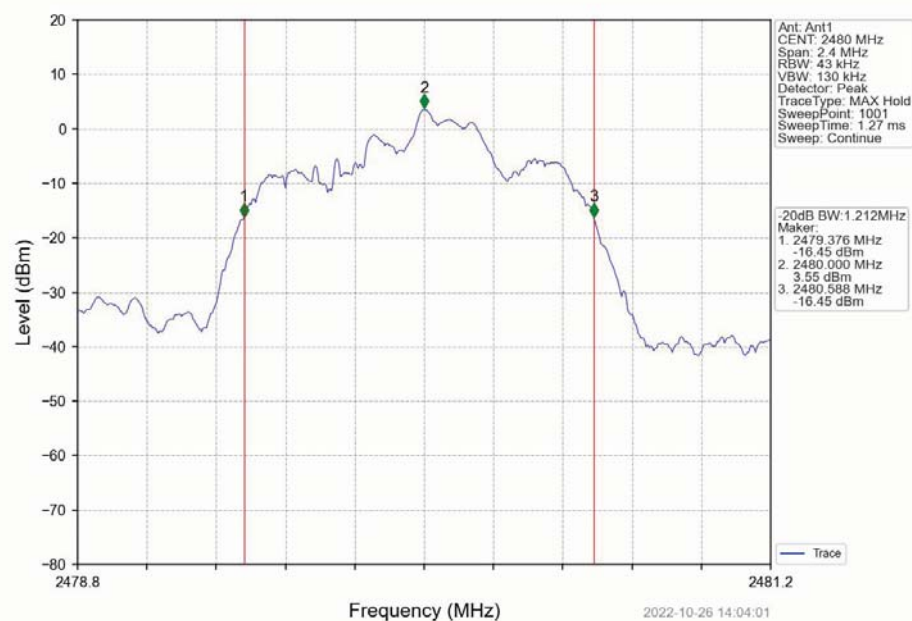
Pi/4DQPSK\_2DH5\_LCH\_2402MHz\_Ant1\_NTNV



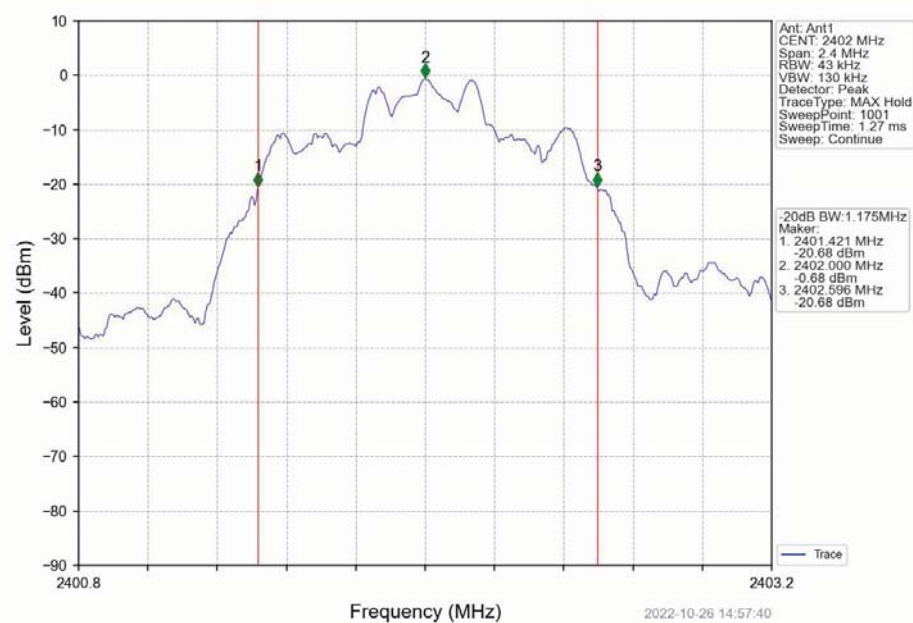
Pi/4DQPSK\_2DH5\_MCH\_2441MHz\_Ant1\_NTNV



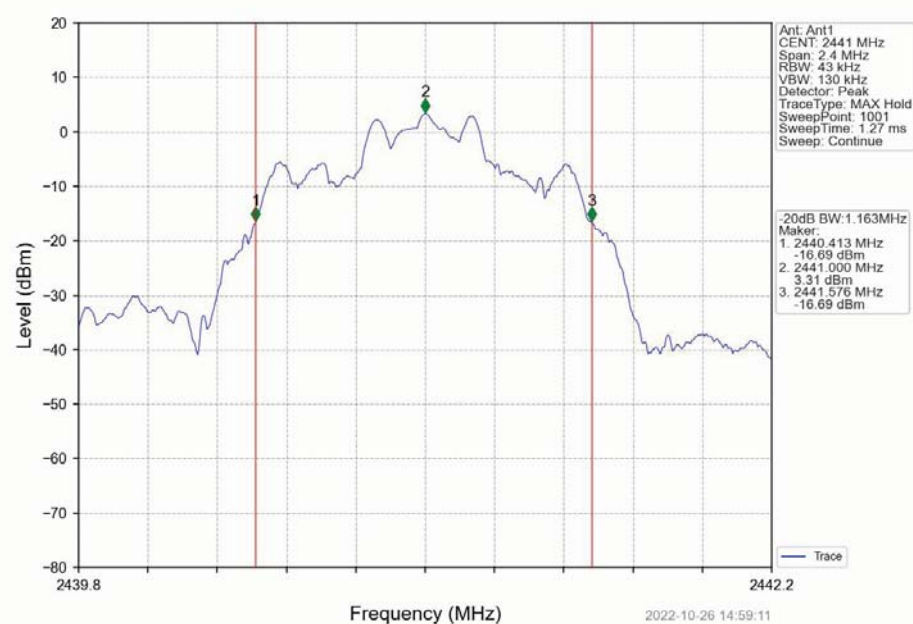
Pi/4DQPSK\_2DH5\_HCH\_2480MHz\_Ant1\_NTNV

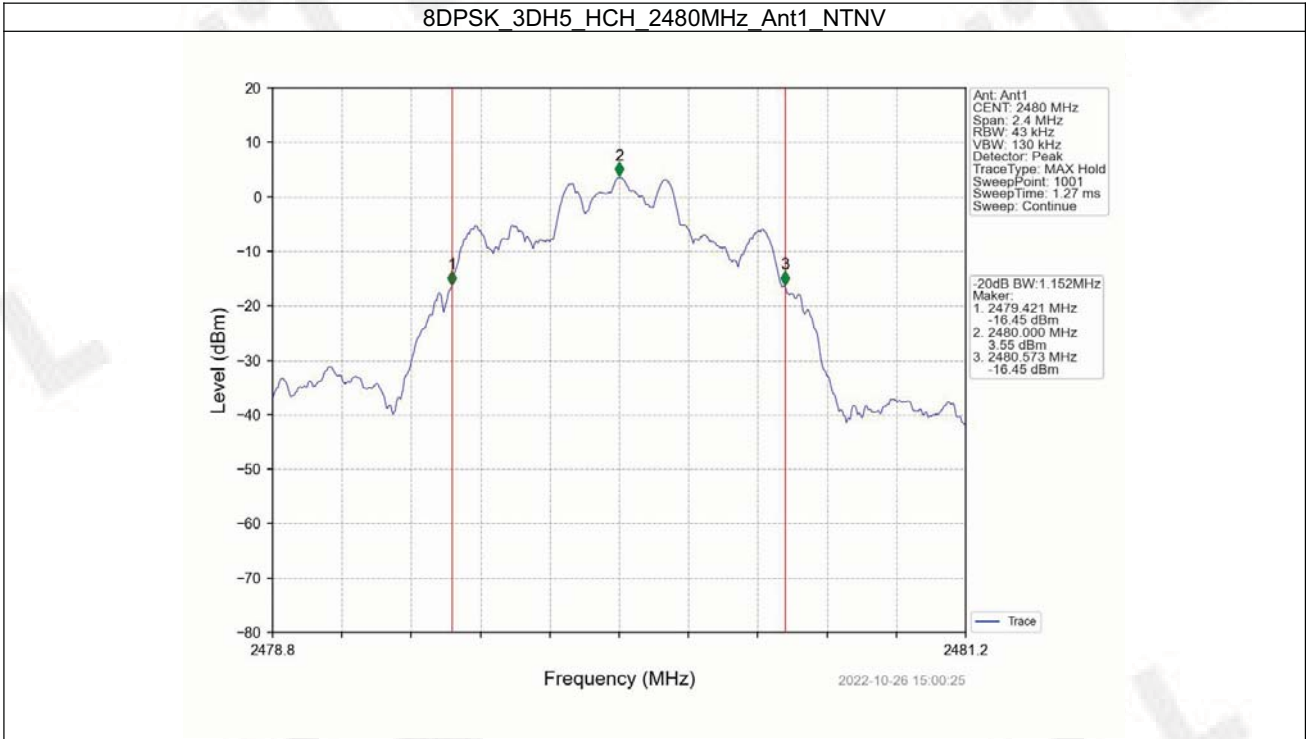


8DPSK\_3DH5\_LCH\_2402MHz\_Ant1\_NTNV



8DPSK\_3DH5\_MCH\_2441MHz\_Ant1\_NTNV





## 2. Maximum Conducted Output Power

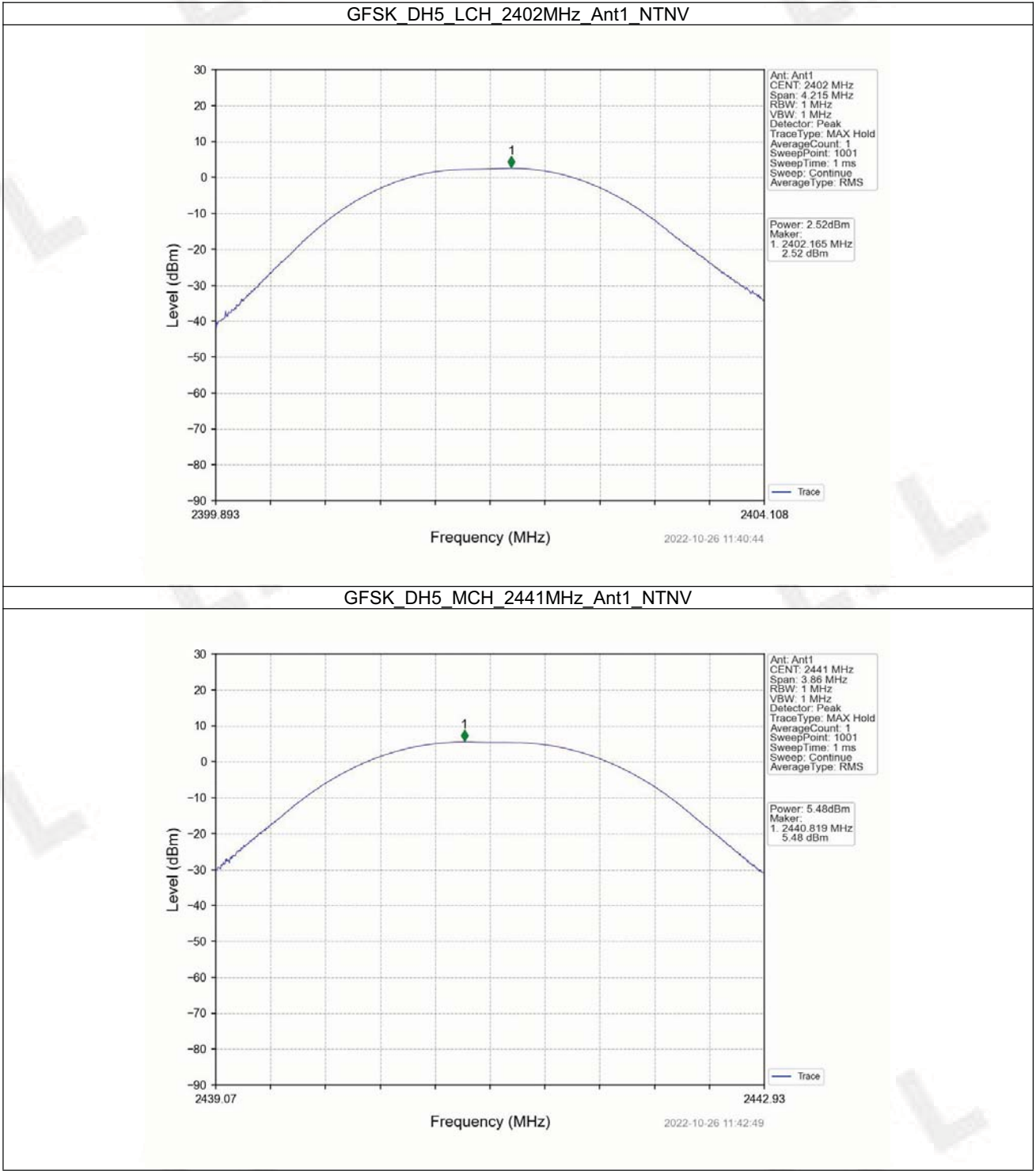
### 2.1 Power

#### 2.1.1 Test Result

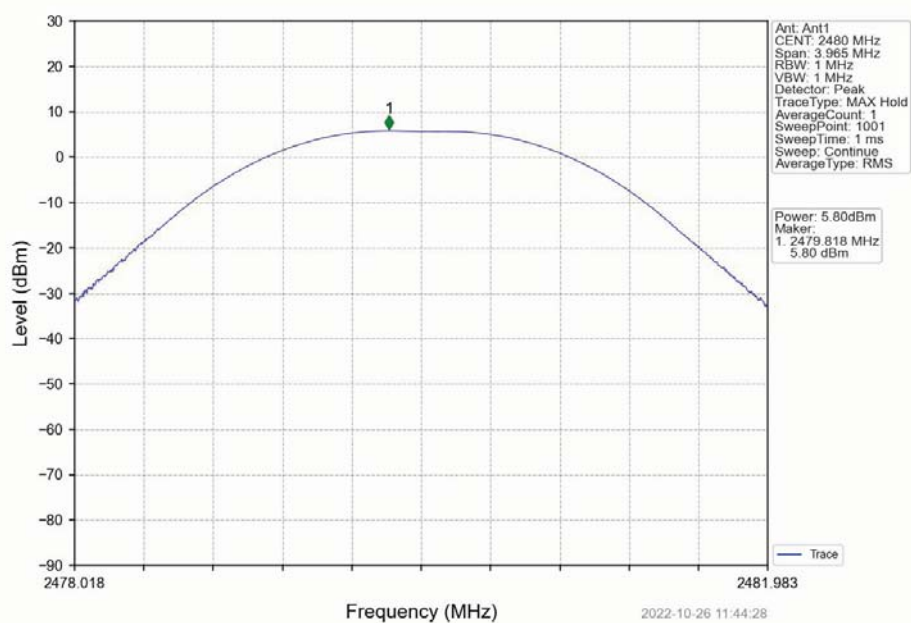
| Mode      | TX Type | Frequency (MHz) | Packet Type | Maximum Peak Conducted Output Power (dBm) |         | Verdict |
|-----------|---------|-----------------|-------------|-------------------------------------------|---------|---------|
|           |         |                 |             | ANT1                                      | Limit   |         |
| GFSK      | SISO    | 2402            | DH5         | 2.52                                      | <=30    | Pass    |
|           |         | 2441            | DH5         | 5.48                                      | <=30    | Pass    |
|           |         | 2480            | DH5         | 5.80                                      | <=30    | Pass    |
| Pi/4DQPSK | SISO    | 2402            | 2DH5        | 0.39                                      | <=20.97 | Pass    |
|           |         | 2441            | 2DH5        | 4.41                                      | <=20.97 | Pass    |
|           |         | 2480            | 2DH5        | 4.53                                      | <=20.97 | Pass    |
| 8DPSK     | SISO    | 2402            | 3DH5        | 0.93                                      | <=20.97 | Pass    |
|           |         | 2441            | 3DH5        | 4.66                                      | <=20.97 | Pass    |
|           |         | 2480            | 3DH5        | 4.80                                      | <=20.97 | Pass    |

Note1: Antenna Gain: Ant1: 3.00dBi;

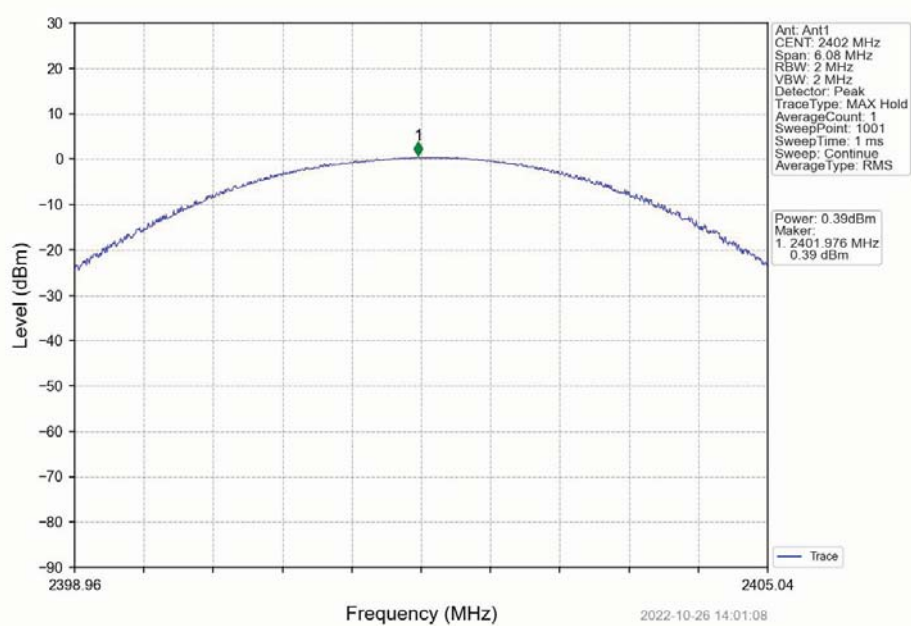
2.1.2 Test Graph



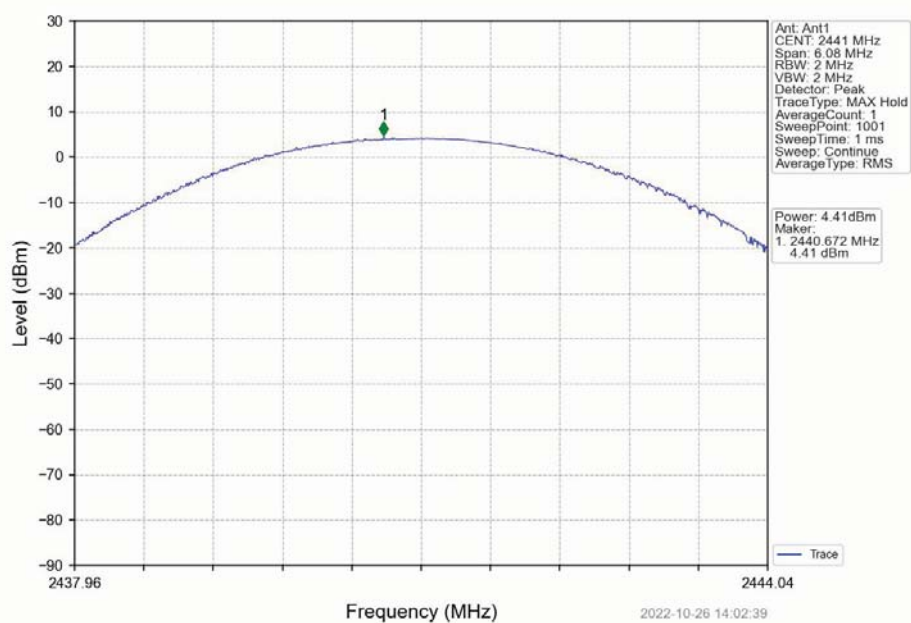
GFSK\_DH5\_HCH\_2480MHz\_Ant1\_NTNV



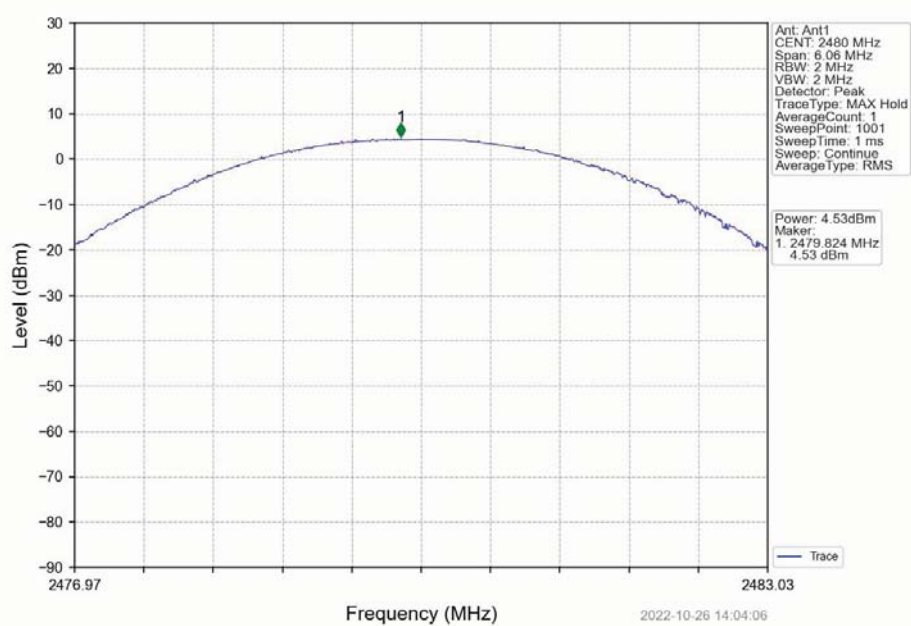
Pi/4DQPSK\_2DH5\_LCH\_2402MHz\_Ant1\_NTNV



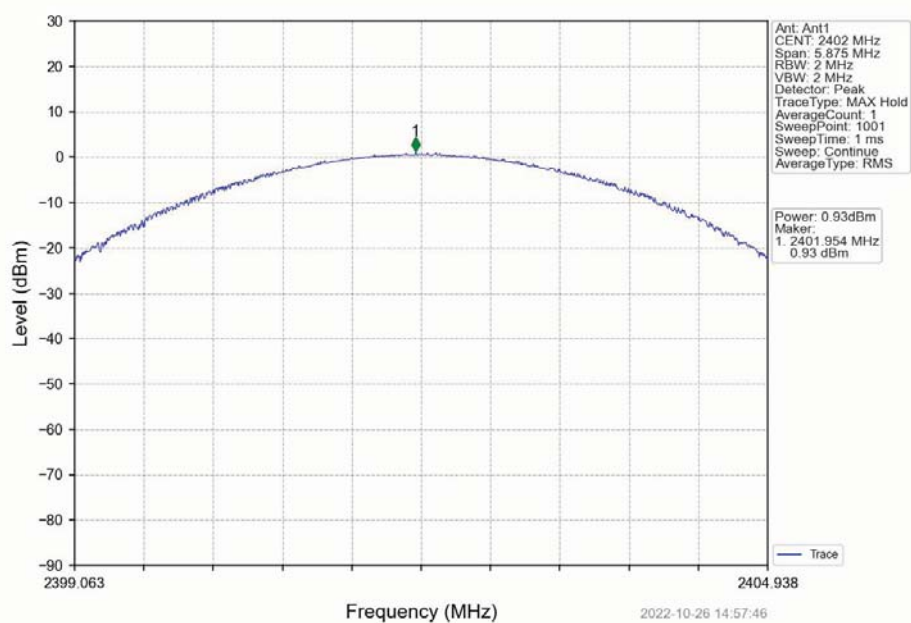
Pi/4DQPSK\_2DH5\_MCH\_2441MHz\_Ant1\_NTNV



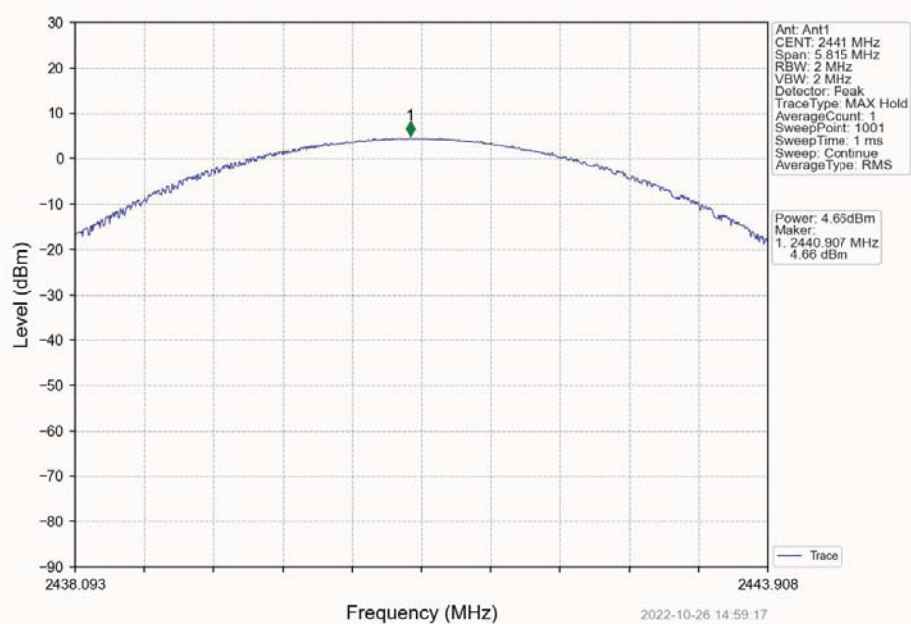
Pi/4DQPSK\_2DH5\_HCH\_2480MHz\_Ant1\_NTNV

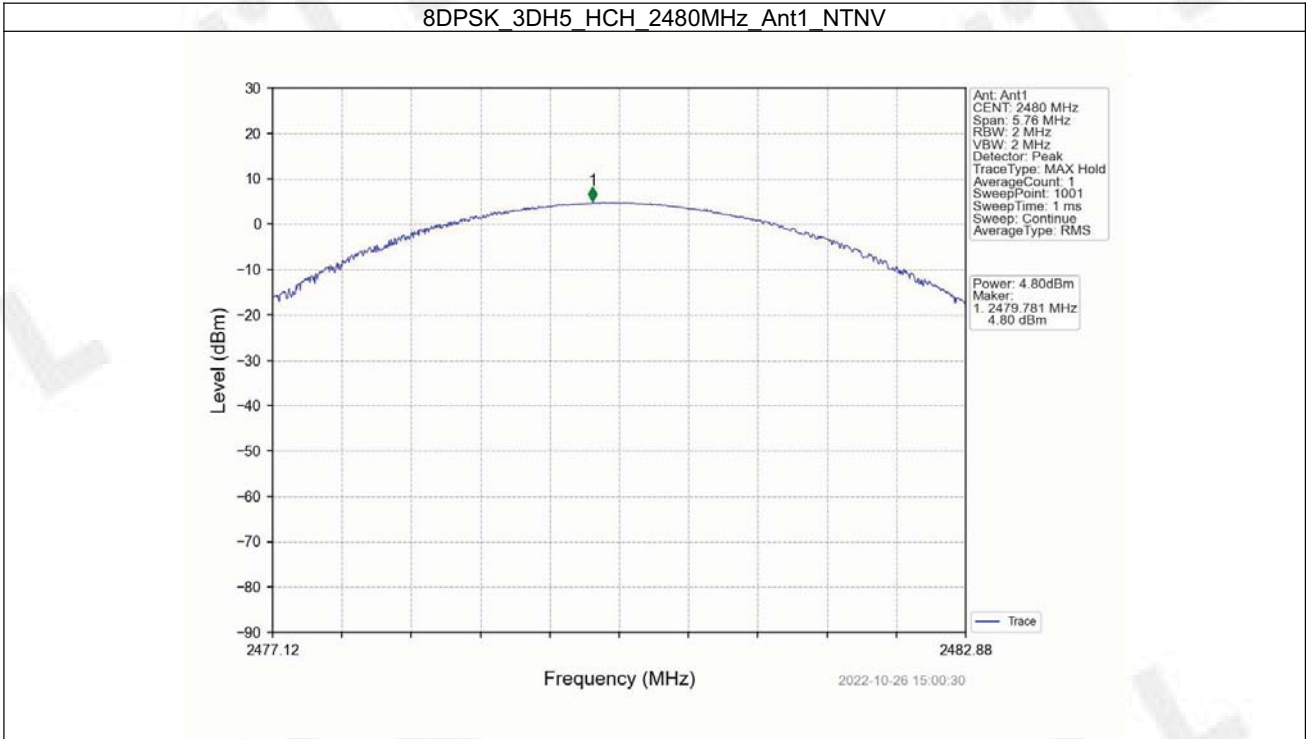


## 8DPSK\_3DH5\_LCH\_2402MHz\_Ant1\_NTNV



## 8DPSK\_3DH5\_MCH\_2441MHz\_Ant1\_NTNV





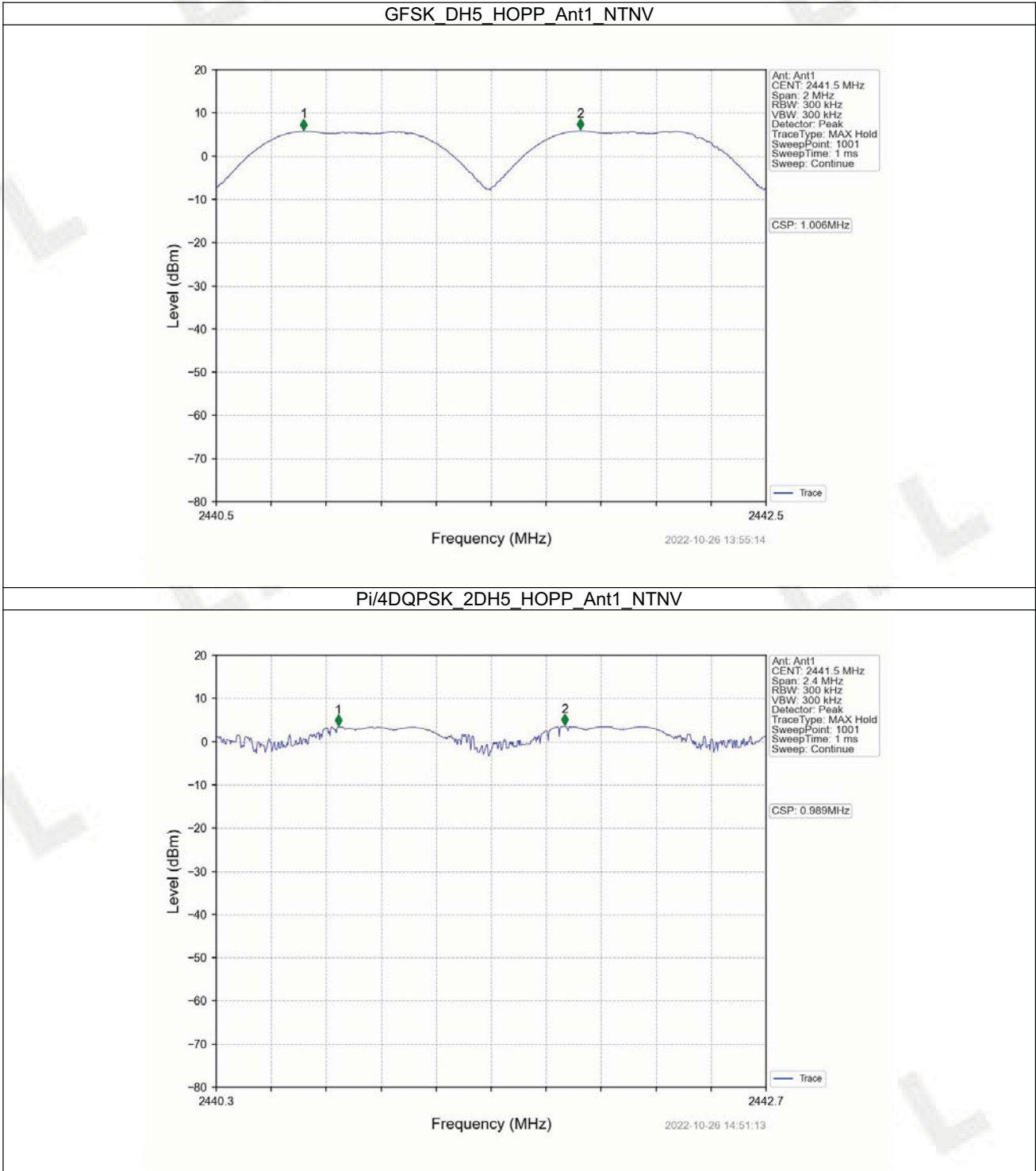
### 3. Carrier Frequency Separation

#### 3.1 Ant1

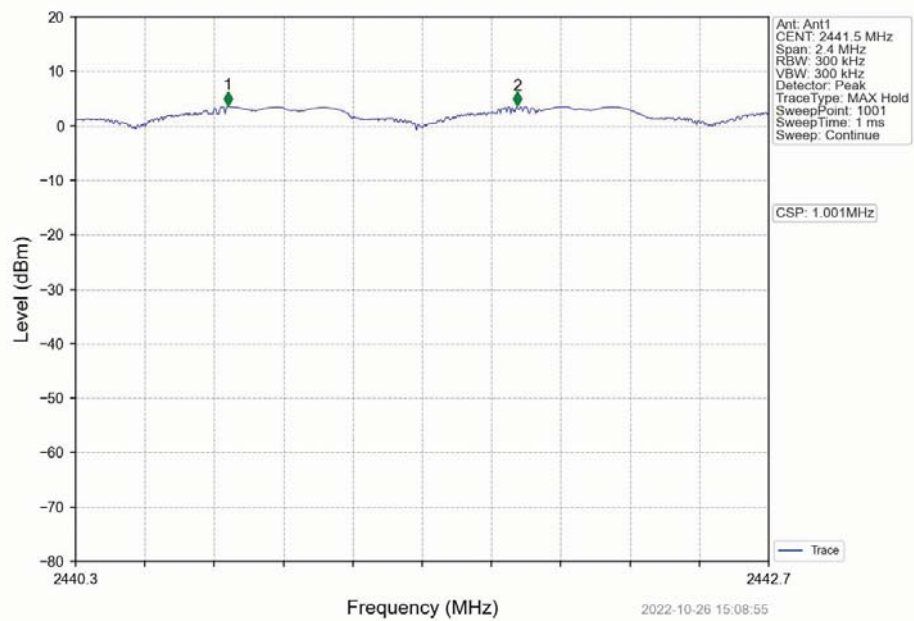
##### 3.1.1 Test Result

| Ant1      |         |                 |             |                          |                      |              |         |
|-----------|---------|-----------------|-------------|--------------------------|----------------------|--------------|---------|
| Mode      | TX Type | Frequency (MHz) | Packet Type | Channel Separation (MHz) | 20dB Bandwidth (MHz) | Limit (MHz)  | Verdict |
| GFSK      | SISO    | HOPP            | DH5         | 1.006                    | 0.843                | $\geq 0.843$ | Pass    |
| Pi/4DQPSK | SISO    | HOPP            | 2DH5        | 0.989                    | 1.216                | $\geq 0.811$ | Pass    |
| 8DPSK     | SISO    | HOPP            | 3DH5        | 1.001                    | 1.175                | $\geq 0.783$ | Pass    |

3.1.2 Test Graph



## 8DPSK\_3DH5\_HOPP\_Ant1\_NTNV



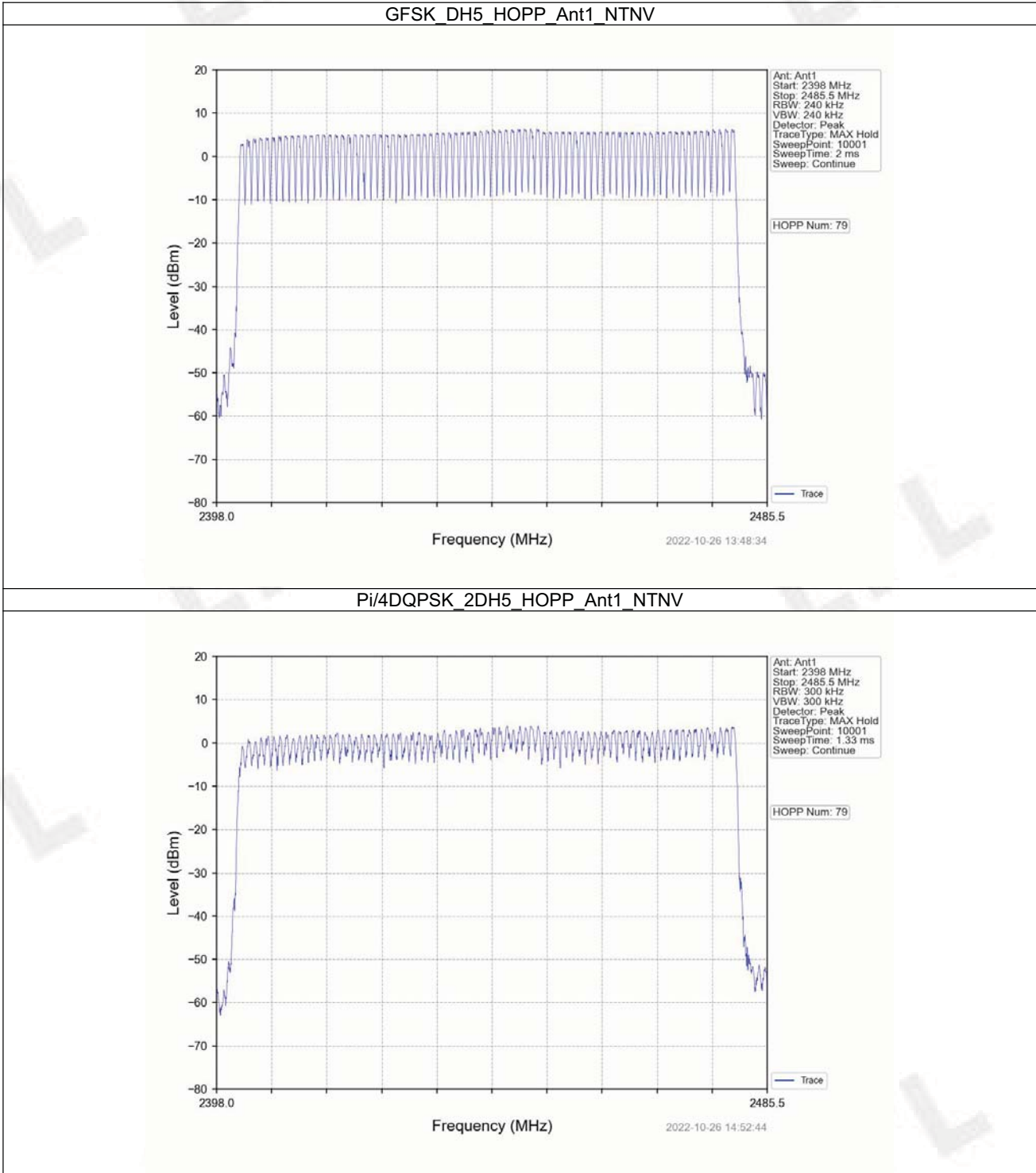
## 4. Number of Hopping Frequencies

### 4.1 HoppNum

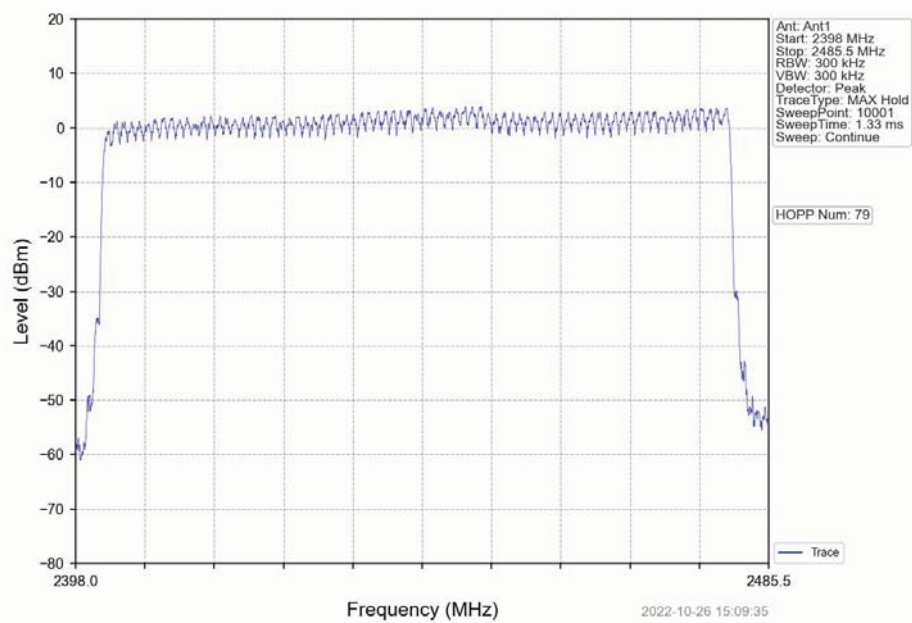
#### 4.1.1 Test Result

| Mode      | TX Type | Frequency (MHz) | Packet Type | Num of Hopping Frequencies |           | Verdict |
|-----------|---------|-----------------|-------------|----------------------------|-----------|---------|
|           |         |                 |             | ANT1                       | Limit     |         |
| GFSK      | SISO    | HOPP            | DH5         | 79                         | $\geq 15$ | Pass    |
| Pi/4DQPSK | SISO    | HOPP            | 2DH5        | 79                         | $\geq 15$ | Pass    |
| 8DPSK     | SISO    | HOPP            | 3DH5        | 79                         | $\geq 15$ | Pass    |

4.1.2 Test Graph



## 8DPSK\_3DH5\_HOPP\_Ant1\_NTNV



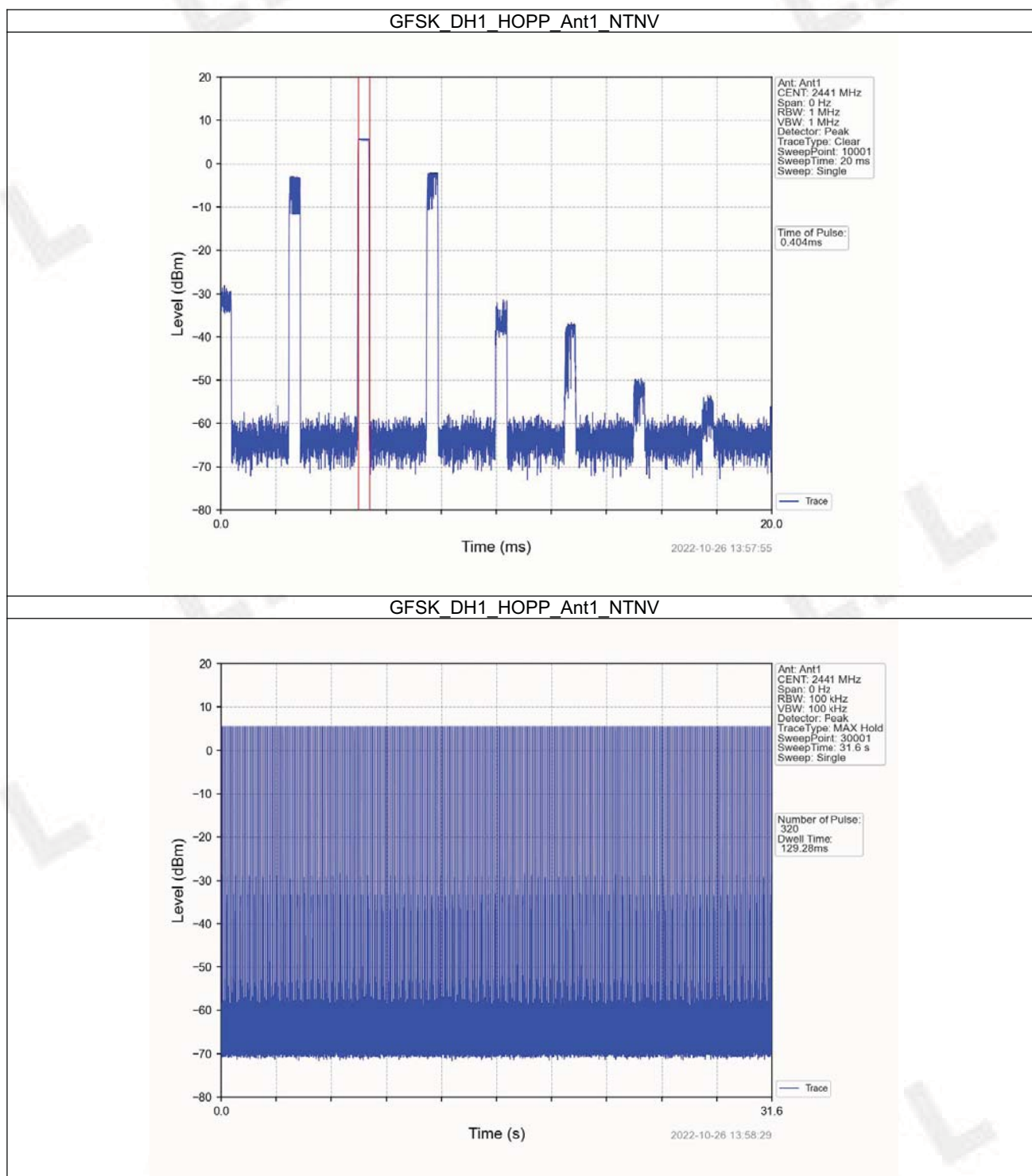
## 5. Time of Occupancy (Dwell Time)

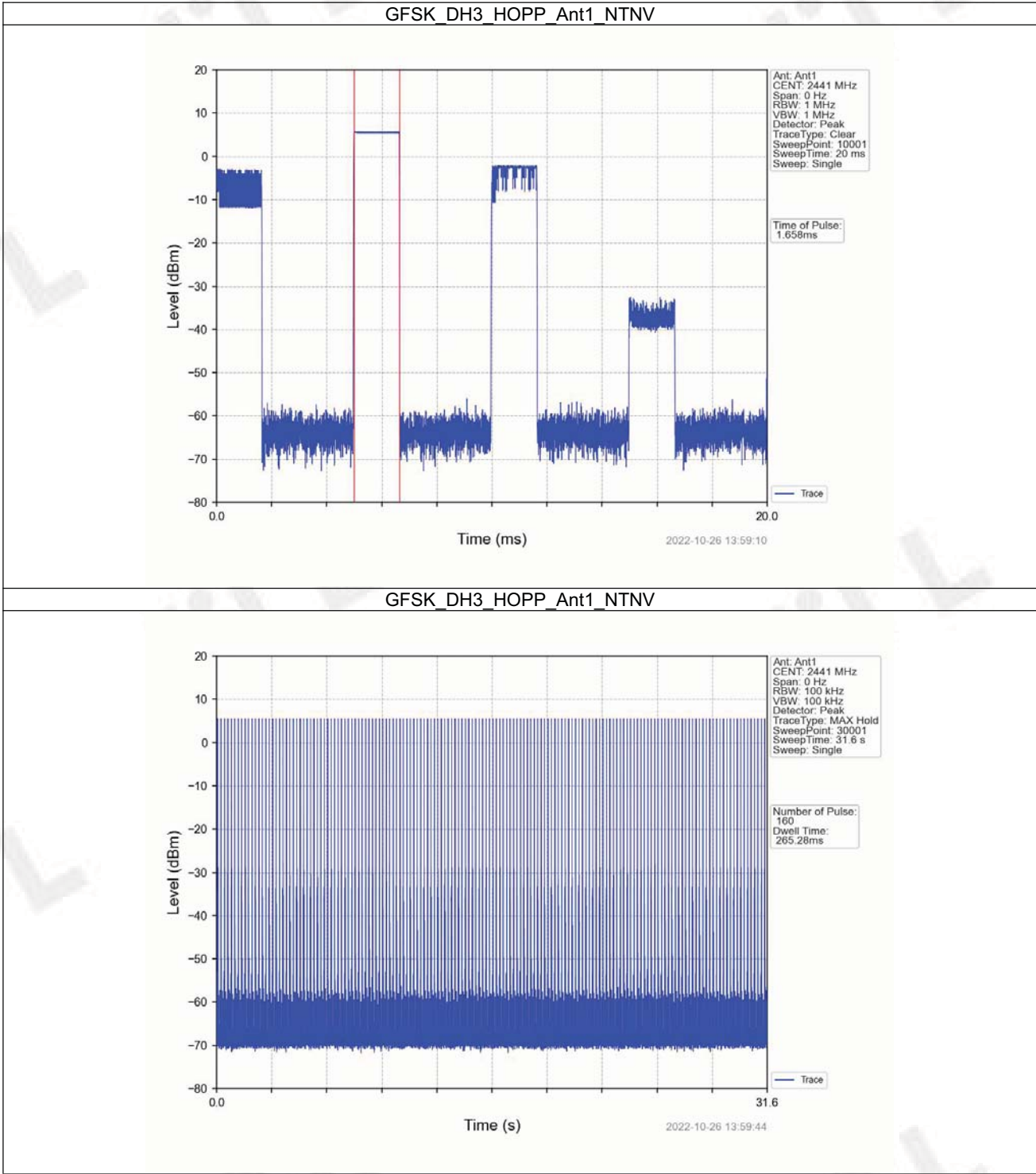
### 5.1 Ant1

#### 5.1.1 Test Result

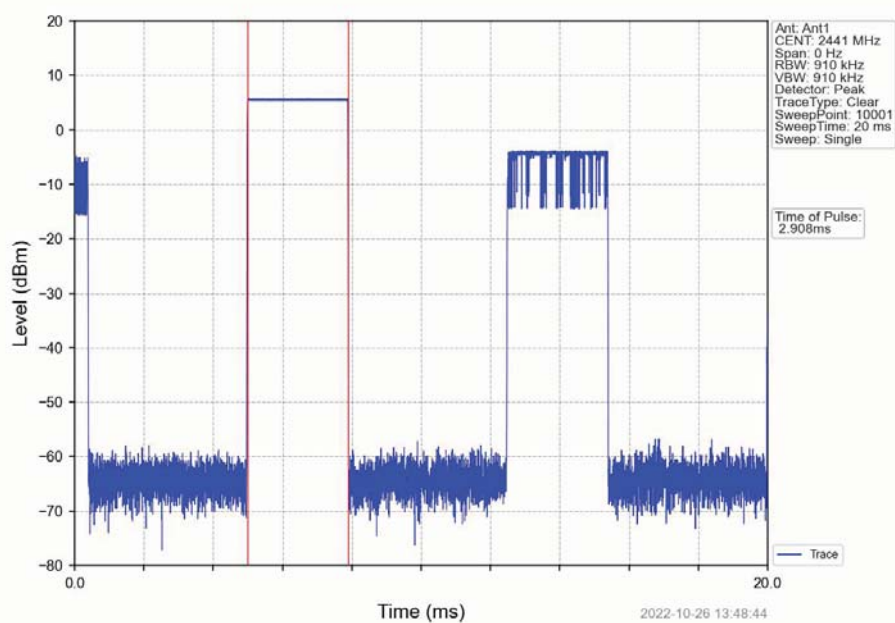
| Ant1      |         |                 |             |                               |                        |                                    |                 |            |         |
|-----------|---------|-----------------|-------------|-------------------------------|------------------------|------------------------------------|-----------------|------------|---------|
| Mode      | Tx Type | Frequency (MHz) | Packet Type | Duration of Single Pulse (ms) | Observation Period (s) | Num of Pulse in Observation Period | Dwell Time (ms) | Limit (ms) | Verdict |
| GFSK      | SISO    | HOPP            | DH1         | 0.404                         | 31.600                 | 320                                | 129.280         | <=400      | Pass    |
|           |         |                 | DH3         | 1.658                         | 31.600                 | 160                                | 265.280         | <=400      | Pass    |
|           |         |                 | DH5         | 2.908                         | 31.600                 | 106                                | 308.248         | <=400      | Pass    |
| Pi/4DQPSK | SISO    | HOPP            | 2DH1        | 0.412                         | 31.600                 | 320                                | 131.840         | <=400      | Pass    |
|           |         |                 | 2DH3        | 1.664                         | 31.600                 | 160                                | 266.240         | <=400      | Pass    |
|           |         |                 | 2DH5        | 2.912                         | 31.600                 | 106                                | 308.672         | <=400      | Pass    |
| 8DPSK     | SISO    | HOPP            | 3DH1        | 0.412                         | 31.600                 | 320                                | 131.840         | <=400      | Pass    |
|           |         |                 | 3DH3        | 1.660                         | 31.600                 | 160                                | 265.600         | <=400      | Pass    |
|           |         |                 | 3DH5        | 2.910                         | 31.600                 | 106                                | 308.460         | <=400      | Pass    |

## 5.1.2 Test Graph

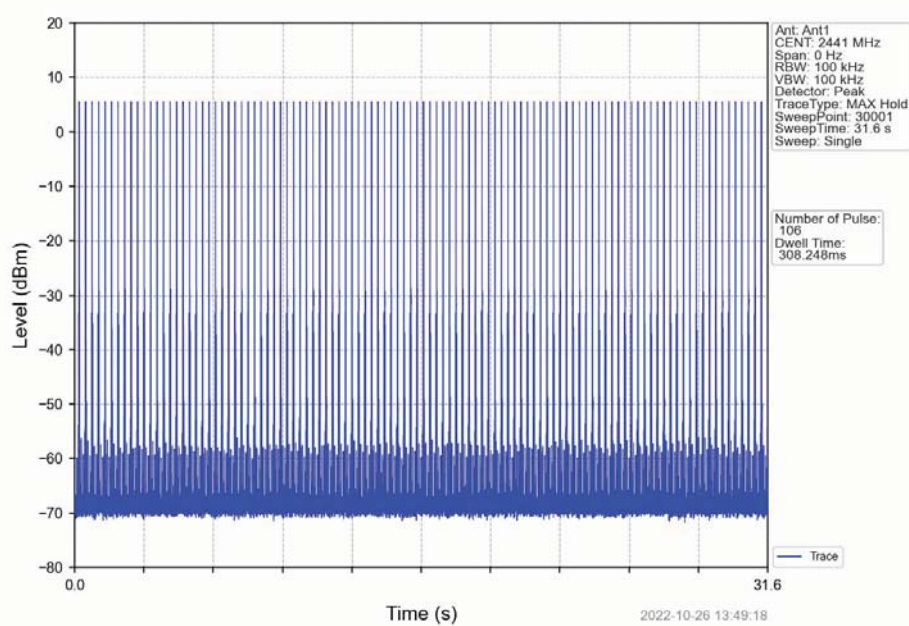




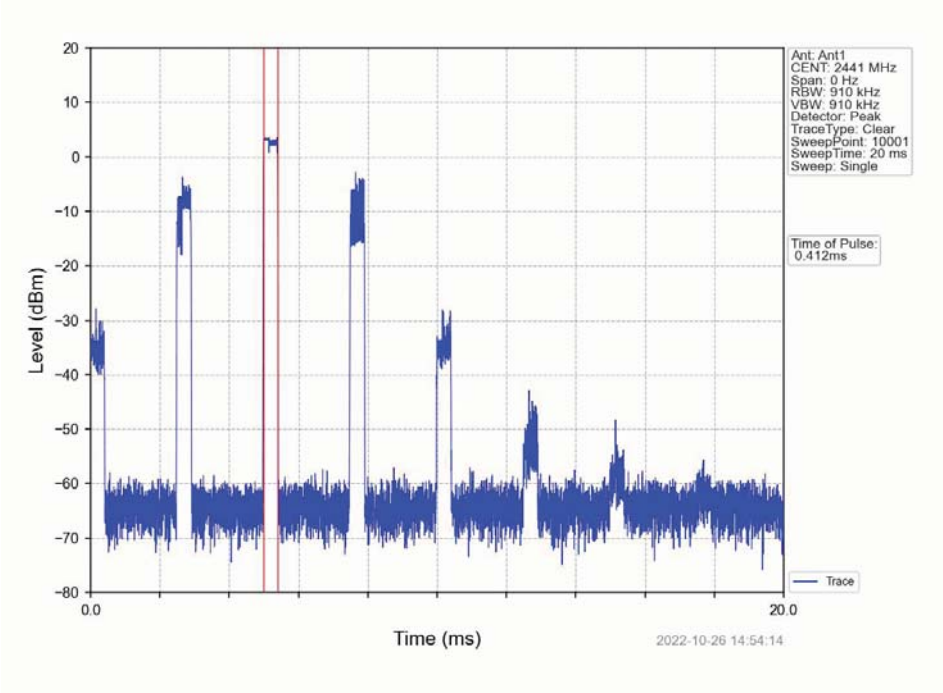
GFSK\_DH5\_HOPP\_Ant1\_NTNV



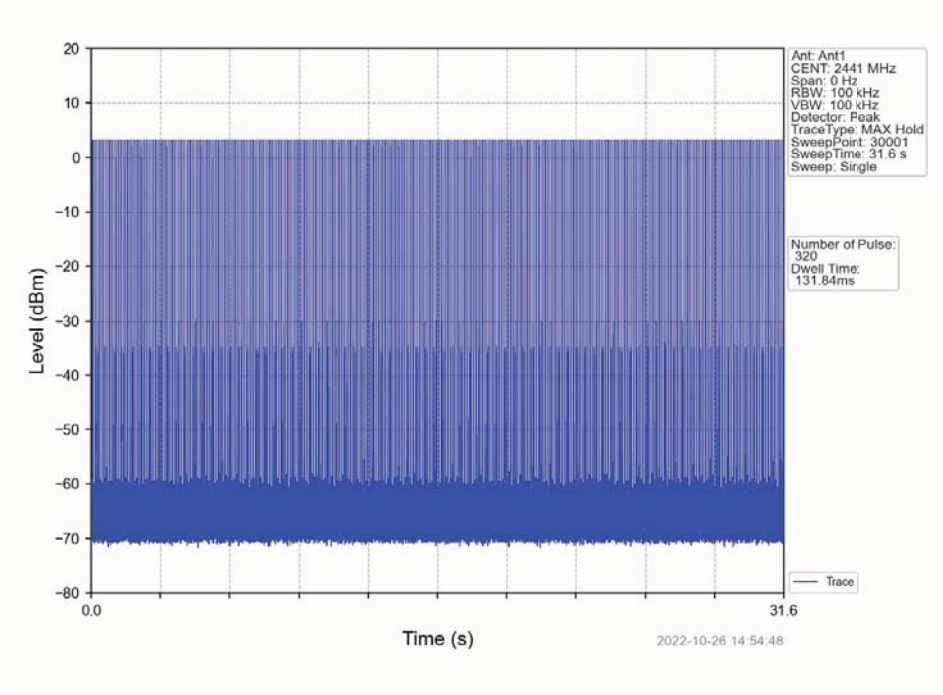
GFSK\_DH5\_HOPP\_Ant1\_NTNV



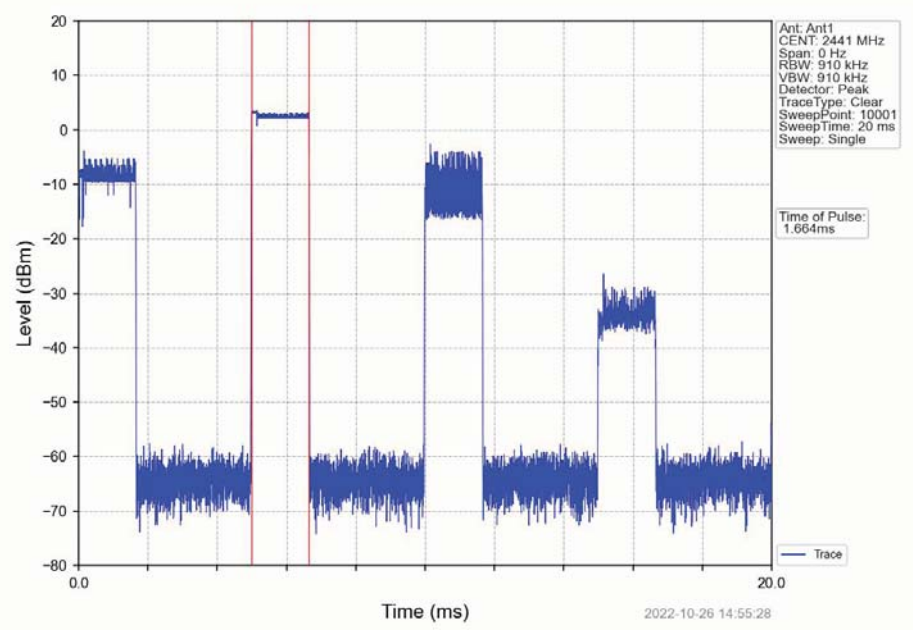
Pi/4DQPSK\_2DH1\_HOPP\_Ant1\_NTNV



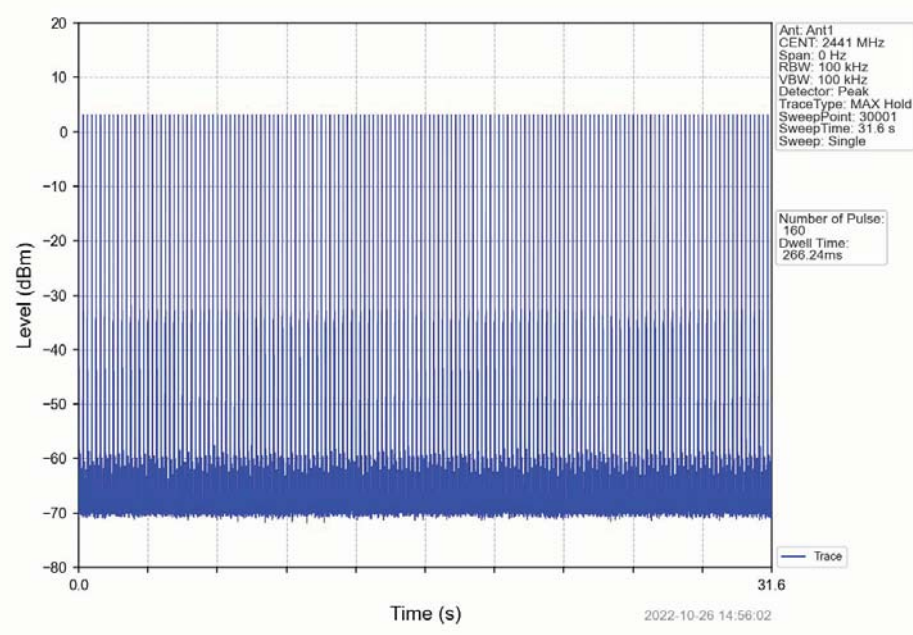
Pi/4DQPSK\_2DH1\_HOPP\_Ant1\_NTNV



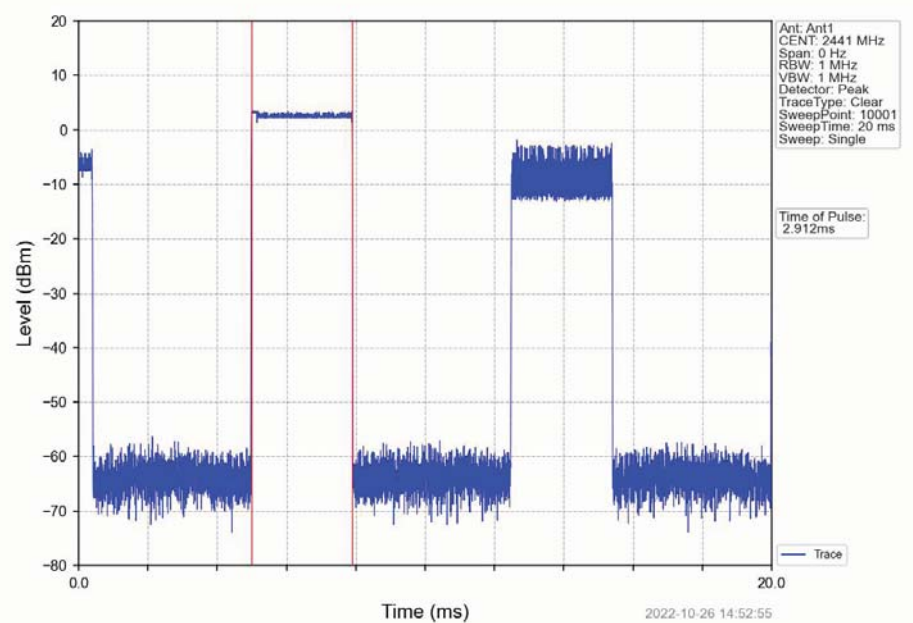
Pi/4DQPSK\_2DH3\_HOPP\_Ant1\_NTNV



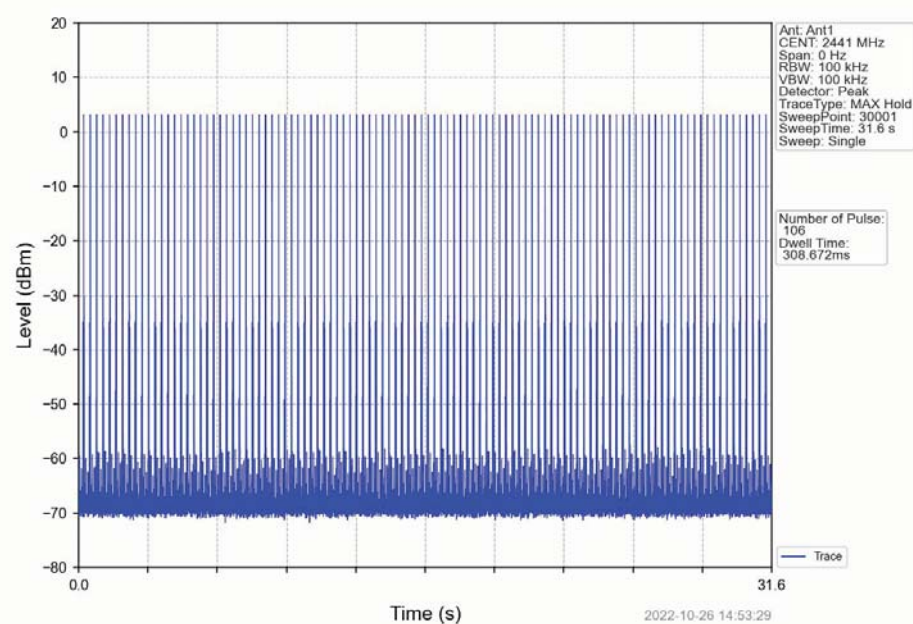
Pi/4DQPSK\_2DH3\_HOPP\_Ant1\_NTNV



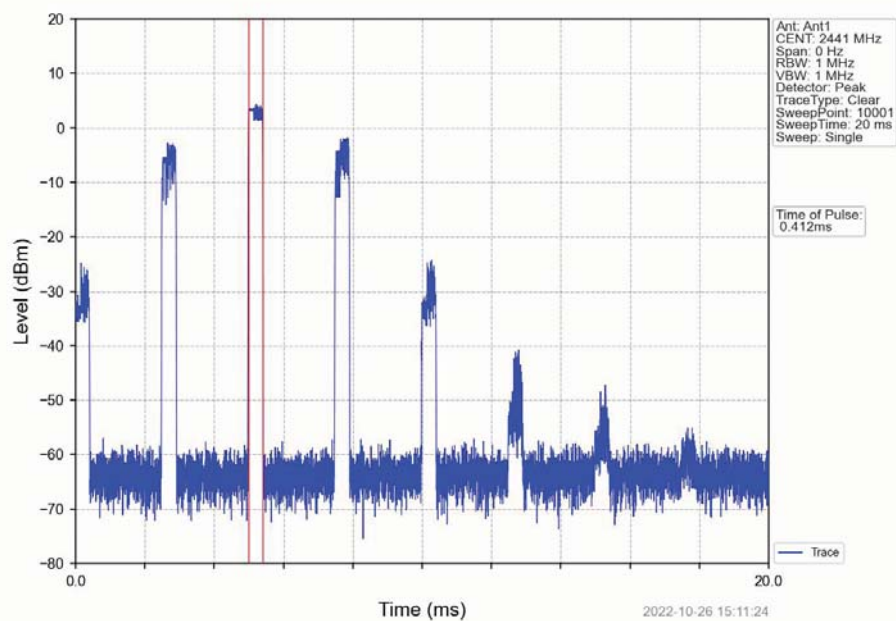
Pi/4DQPSK\_2DH5\_HOPP\_Ant1\_NTNV



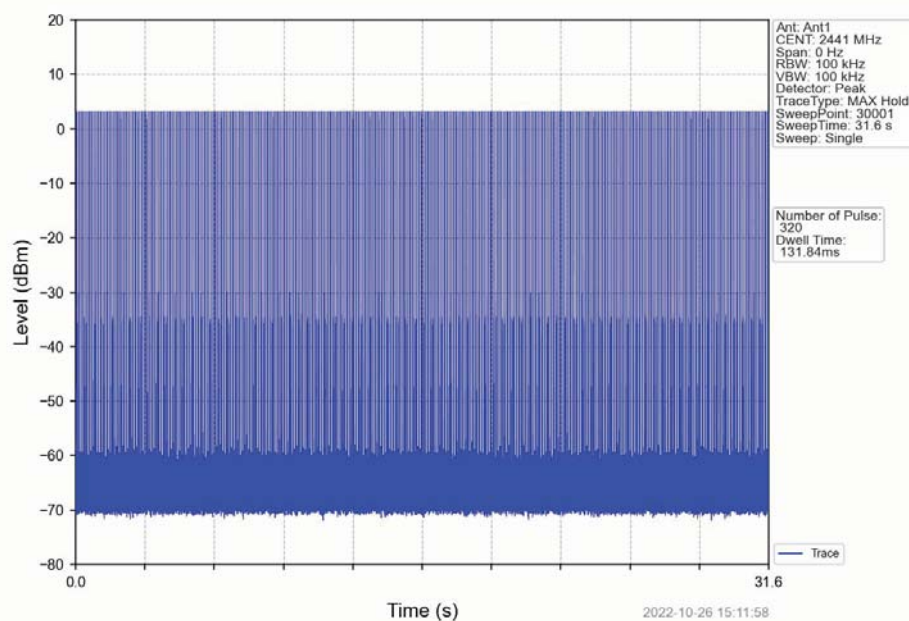
Pi/4DQPSK\_2DH5\_HOPP\_Ant1\_NTNV

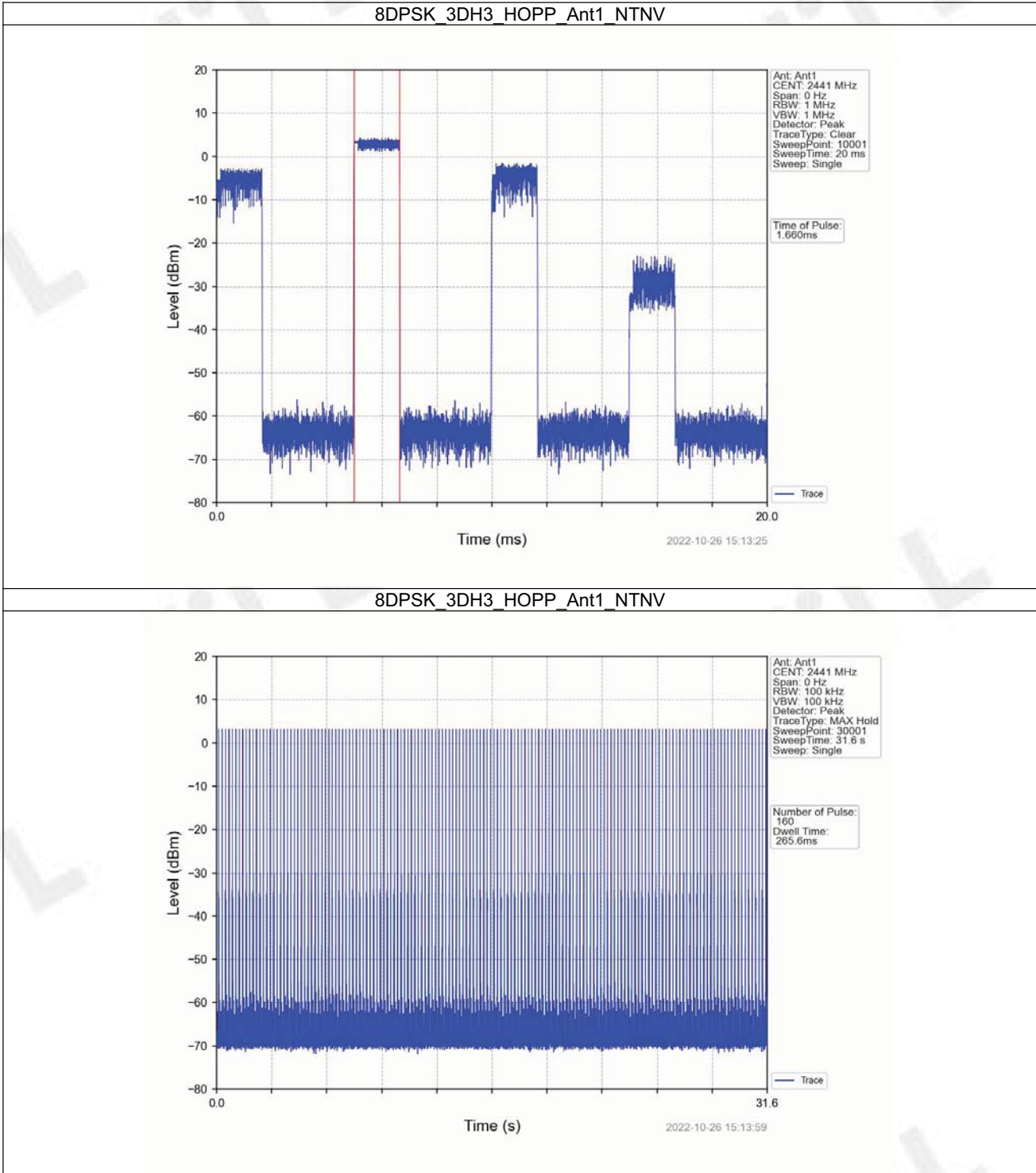


8DPSK\_3DH1\_HOPP\_Ant1\_NTNV

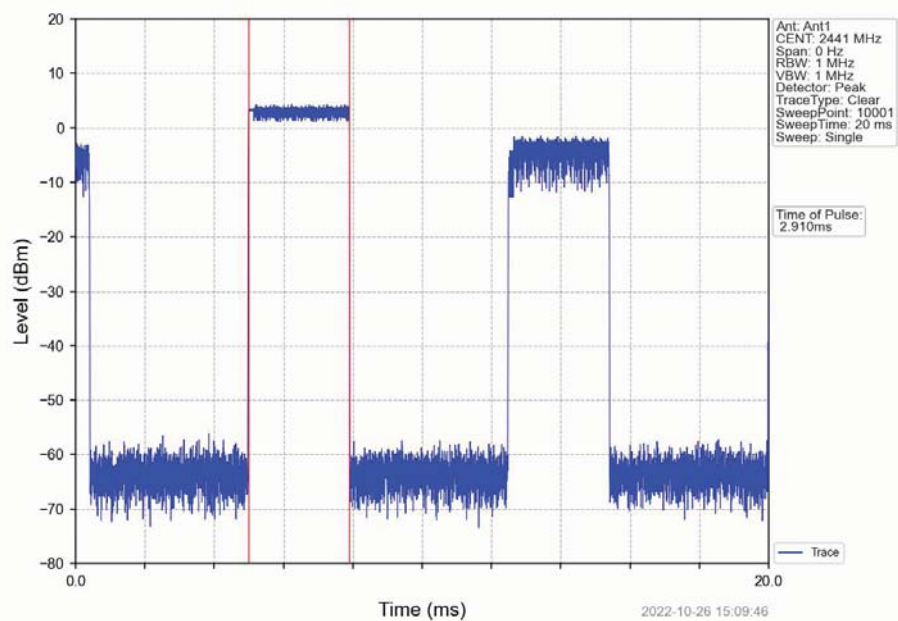


8DPSK\_3DH1\_HOPP\_Ant1\_NTNV

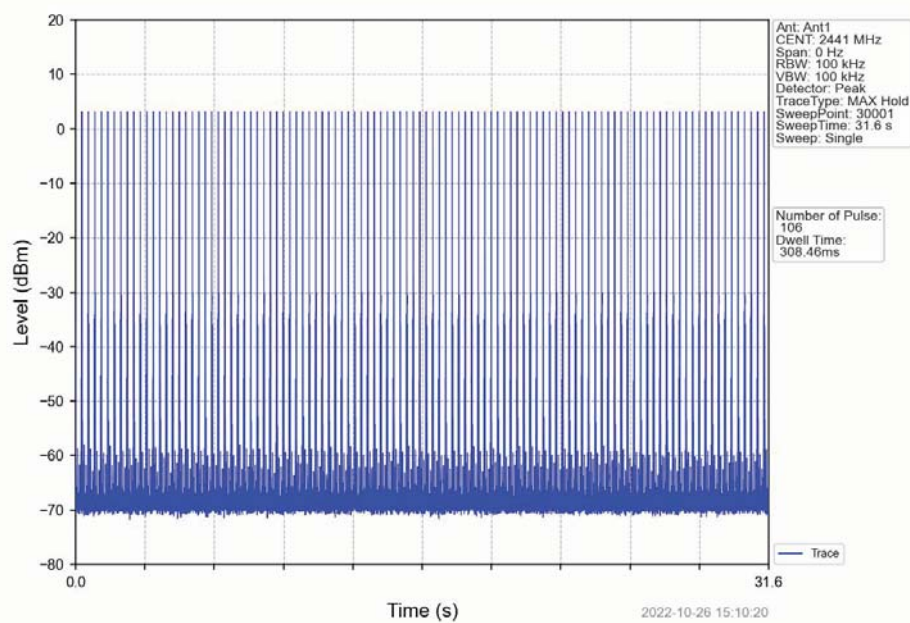




8DPSK\_3DH5\_HOPP\_Ant1\_NTNV



8DPSK\_3DH5\_HOPP\_Ant1\_NTNV



## 6. Unwanted Emissions In Non-restricted Frequency Bands

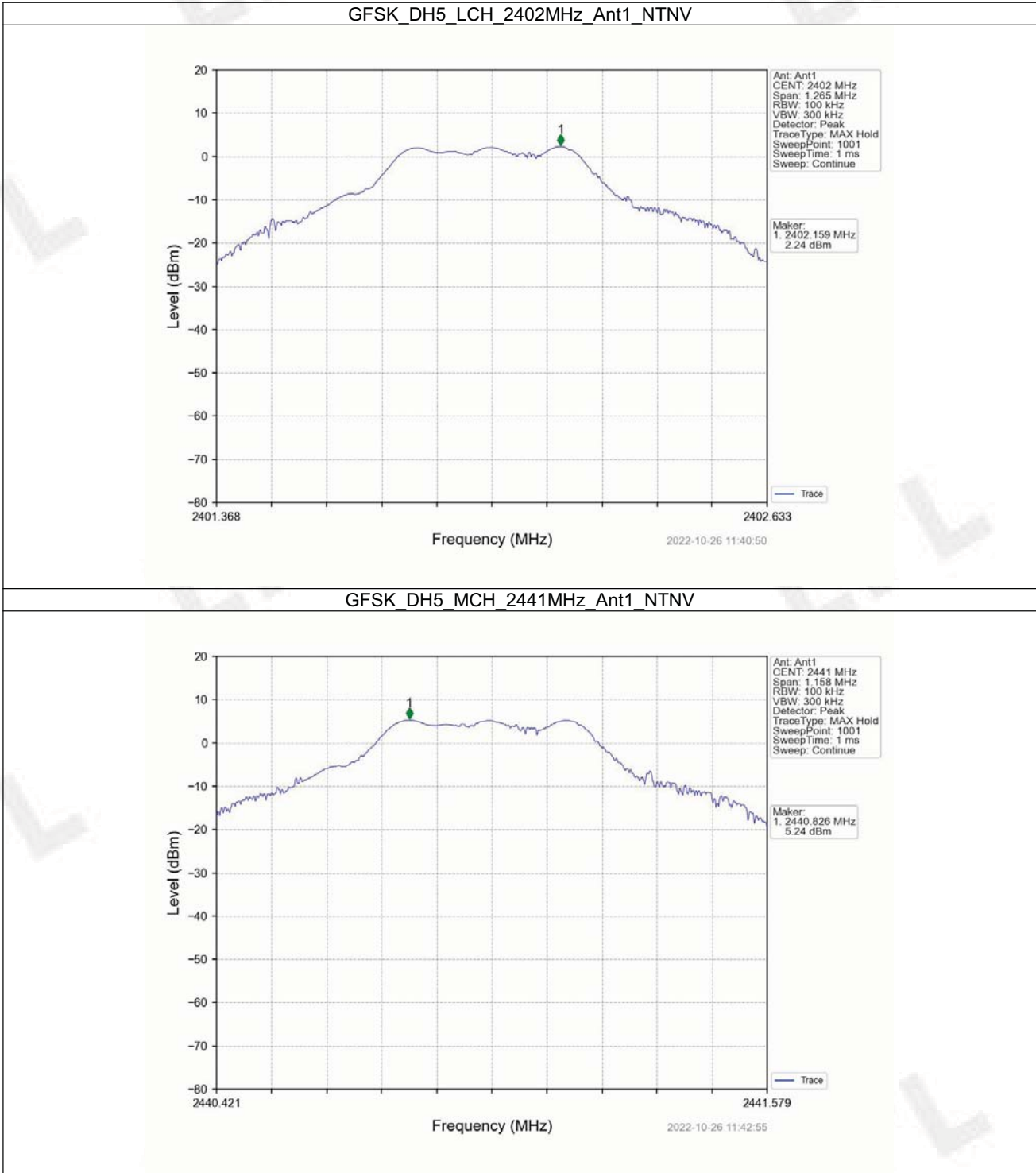
### 6.1 Ref

#### 6.1.1 Test Result

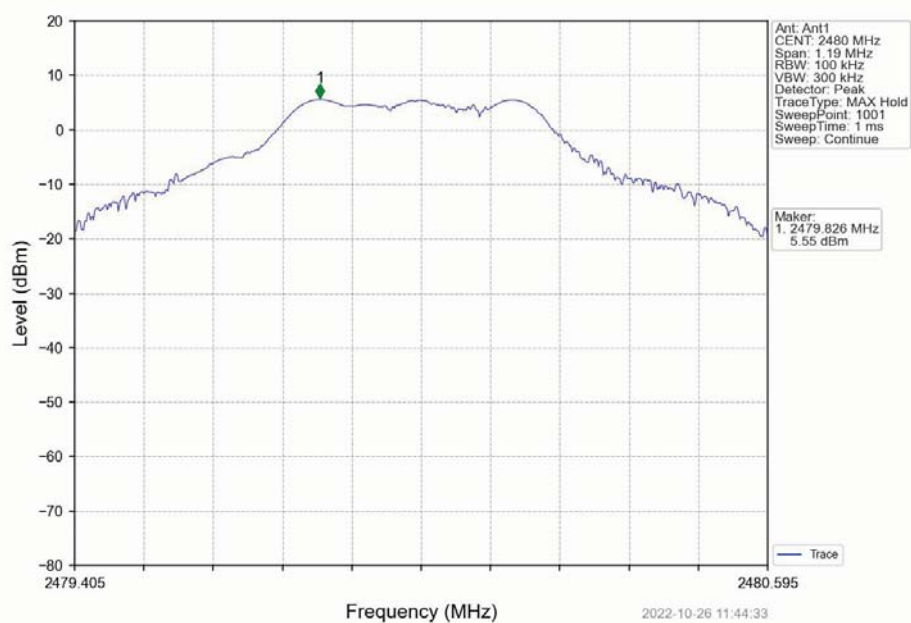
| Mode      | TX Type | Frequency (MHz) | Packet Type | ANT | Level of Reference (dBm) |
|-----------|---------|-----------------|-------------|-----|--------------------------|
| GFSK      | SISO    | 2402            | DH5         | 1   | 2.24                     |
|           |         | 2441            | DH5         | 1   | 5.24                     |
|           |         | 2480            | DH5         | 1   | 5.55                     |
| Pi/4DQPSK | SISO    | 2402            | 2DH5        | 1   | -0.82                    |
|           |         | 2441            | 2DH5        | 1   | 3.19                     |
|           |         | 2480            | 2DH5        | 1   | 3.42                     |
| 8DPSK     | SISO    | 2402            | 3DH5        | 1   | -0.68                    |
|           |         | 2441            | 3DH5        | 1   | 3.30                     |
|           |         | 2480            | 3DH5        | 1   | 3.56                     |

Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.

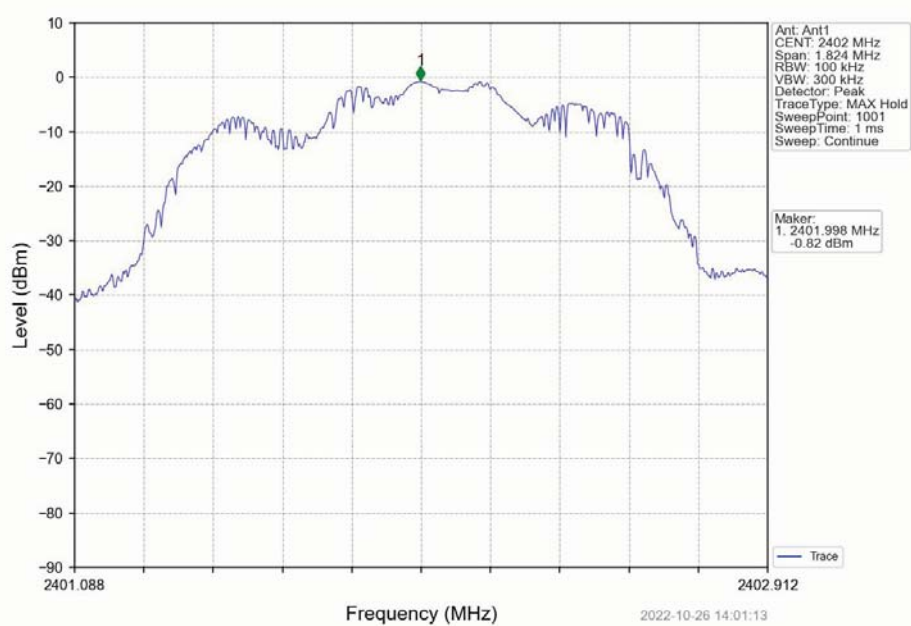
6.1.2 Test Graph



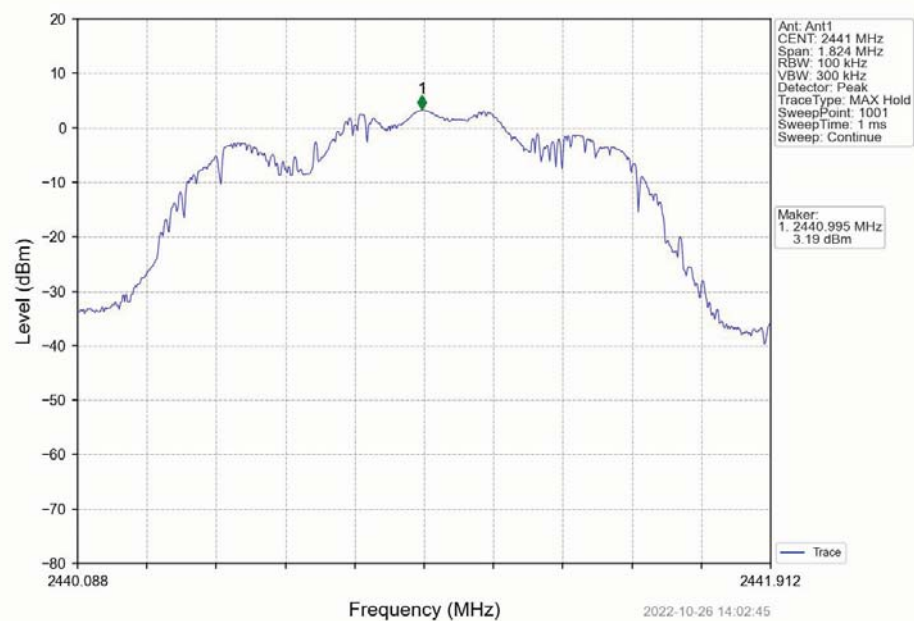
GFSK\_DH5\_HCH\_2480MHz\_Ant1\_NTNV



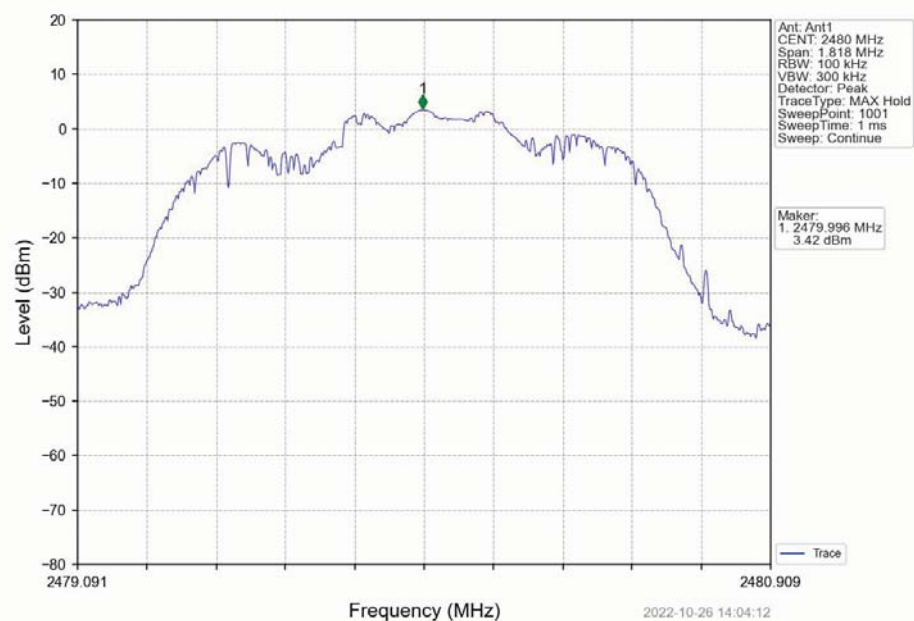
Pi/4DQPSK\_2DH5\_LCH\_2402MHz\_Ant1\_NTNV



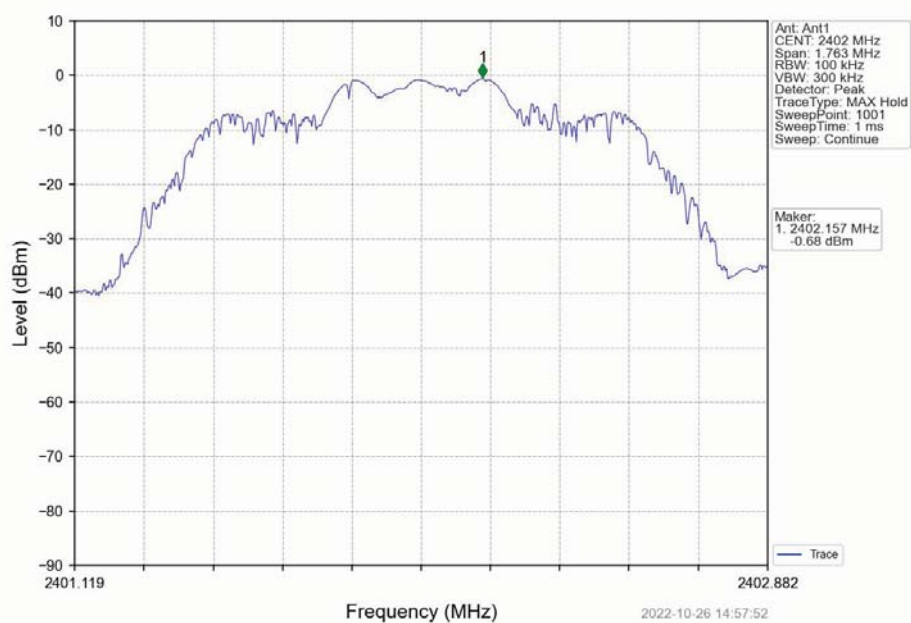
Pi/4DQPSK\_2DH5\_MCH\_2441MHz\_Ant1\_NTNV



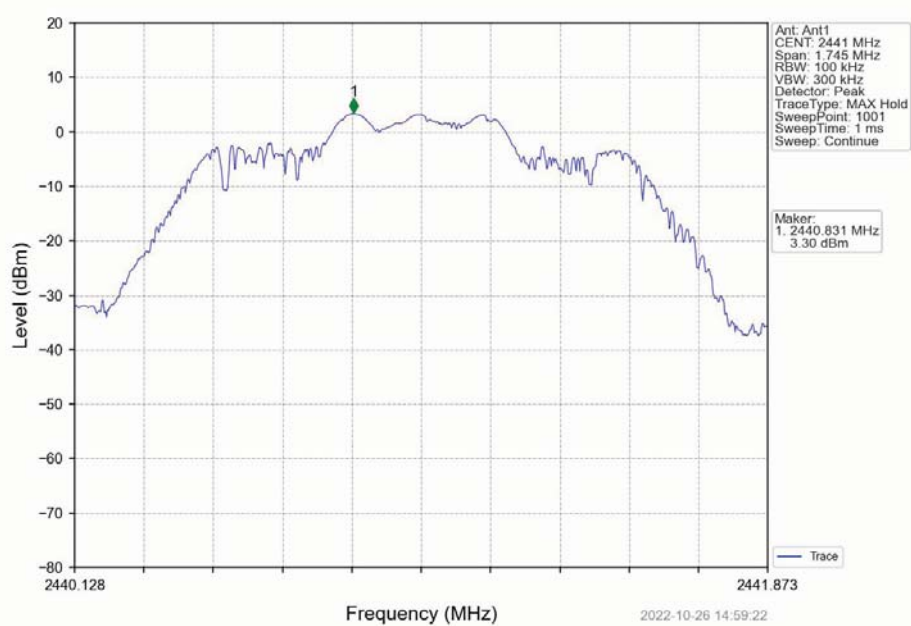
Pi/4DQPSK\_2DH5\_HCH\_2480MHz\_Ant1\_NTNV



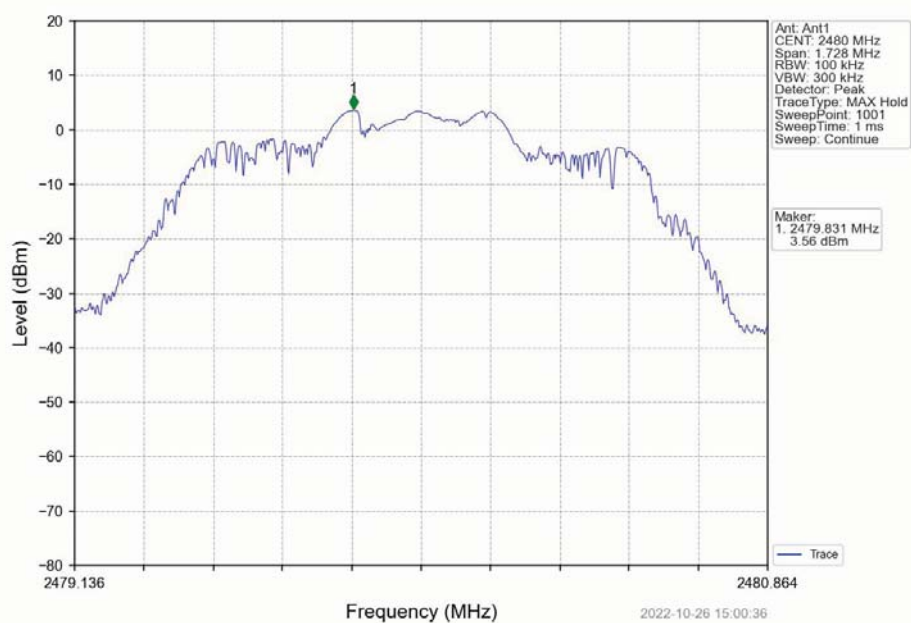
8DPSK\_3DH5\_LCH\_2402MHz\_Ant1\_NTNV



8DPSK\_3DH5\_MCH\_2441MHz\_Ant1\_NTNV



8DPSK\_3DH5\_HCH\_2480MHz\_Ant1\_NTNV



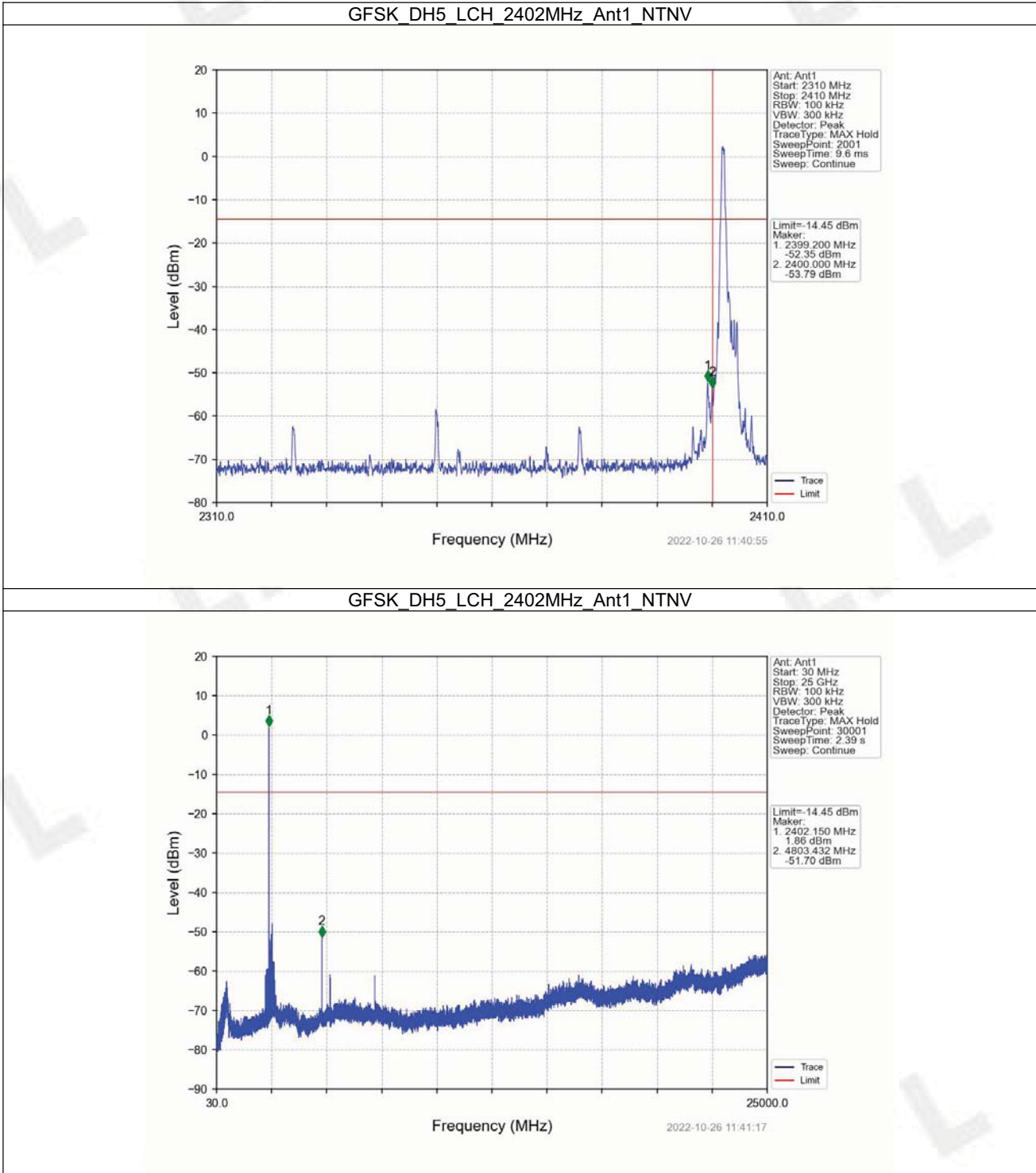
## 6.2 CSE

## 6.2.1 Test Result

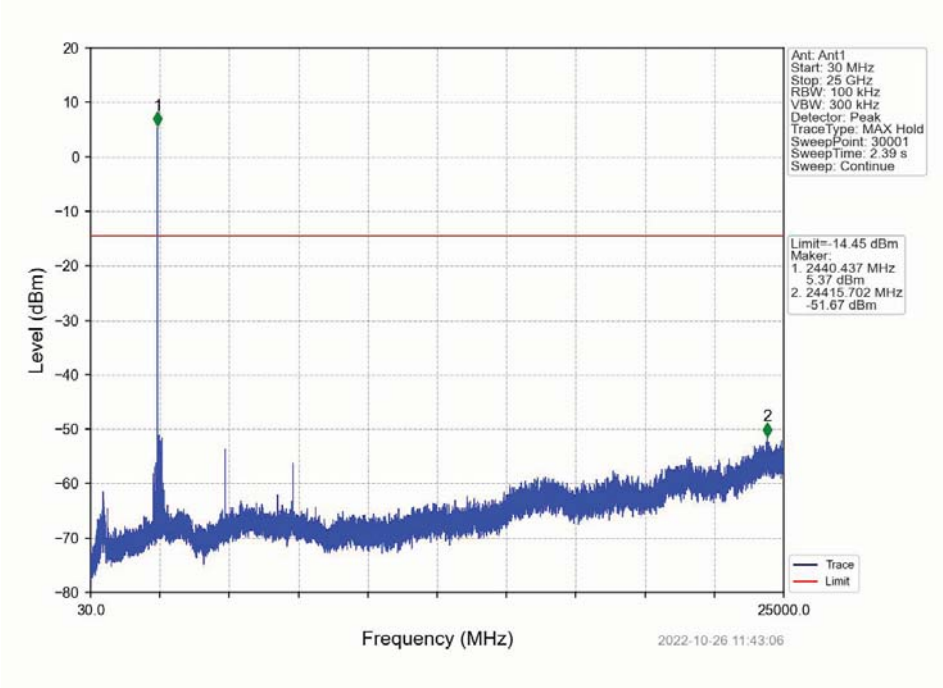
| Mode      | TX Type | Frequency (MHz) | Packet Type | ANT | Level of Reference (dBm) | Limit (dBm) | Verdict |
|-----------|---------|-----------------|-------------|-----|--------------------------|-------------|---------|
| GFSK      | SISO    | 2402            | DH5         | 1   | 5.55                     | -14.45      | Pass    |
|           |         | 2441            | DH5         | 1   | 5.55                     | -14.45      | Pass    |
|           |         | 2480            | DH5         | 1   | 5.55                     | -14.45      | Pass    |
|           |         | HOPP            | DH5         | 1   | 5.55                     | -14.45      | Pass    |
| Pi/4DQPSK | SISO    | 2402            | 2DH5        | 1   | 3.42                     | -16.58      | Pass    |
|           |         | 2441            | 2DH5        | 1   | 3.42                     | -16.58      | Pass    |
|           |         | 2480            | 2DH5        | 1   | 3.42                     | -16.58      | Pass    |
|           |         | HOPP            | 2DH5        | 1   | 3.42                     | -16.58      | Pass    |
| 8DPSK     | SISO    | 2402            | 3DH5        | 1   | 3.56                     | -16.44      | Pass    |
|           |         | 2441            | 3DH5        | 1   | 3.56                     | -16.44      | Pass    |
|           |         | 2480            | 3DH5        | 1   | 3.56                     | -16.44      | Pass    |
|           |         | HOPP            | 3DH5        | 1   | 3.56                     | -16.44      | Pass    |

Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.

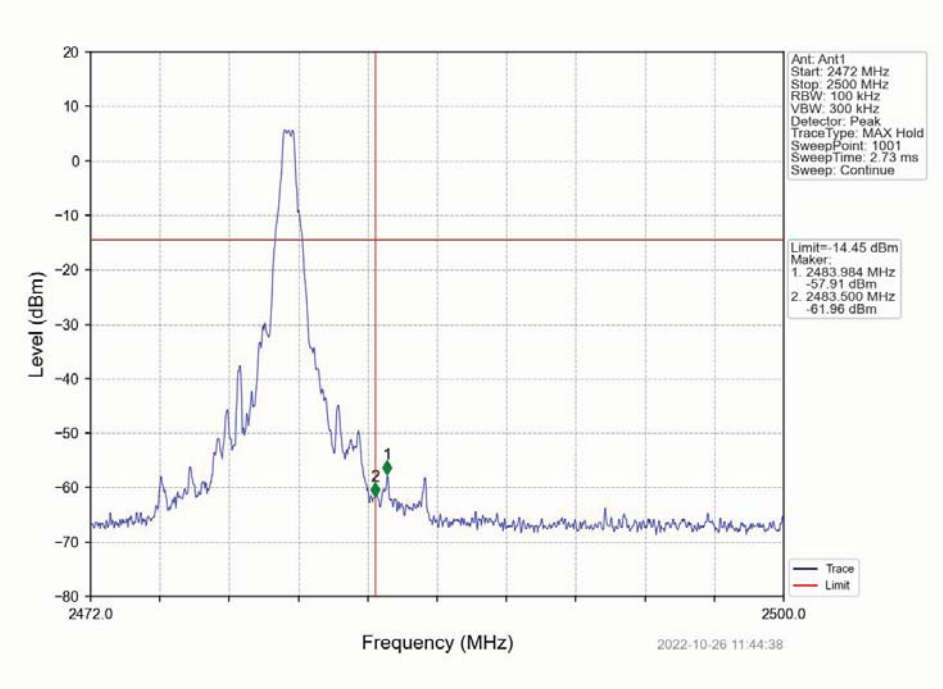
6.2.2 Test Graph



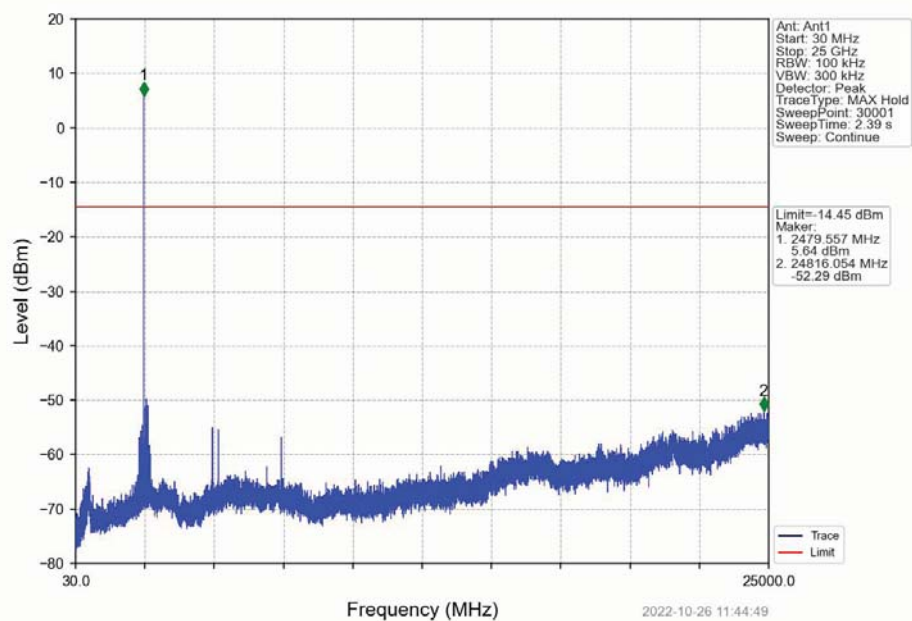
GFSK\_DH5\_MCH\_2441MHz\_Ant1\_NTNV



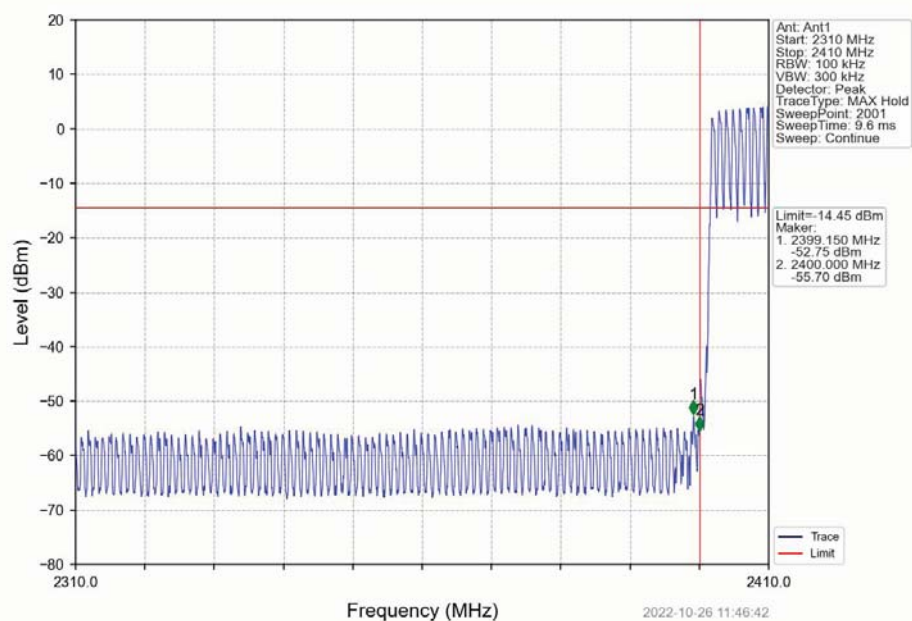
GFSK\_DH5\_HCH\_2480MHz\_Ant1\_NTNV



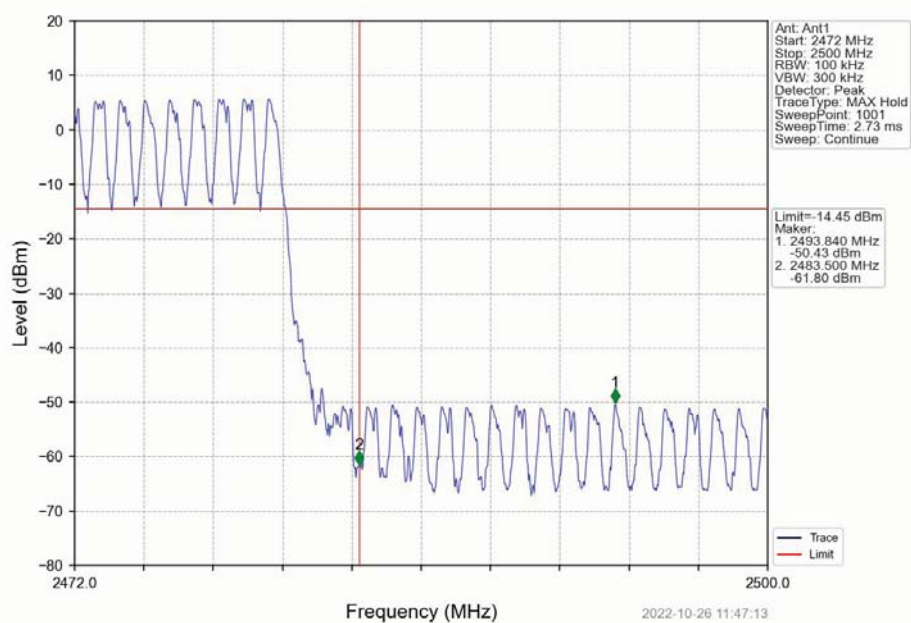
GFSK\_DH5\_HCH\_2480MHz\_Ant1\_NTNV



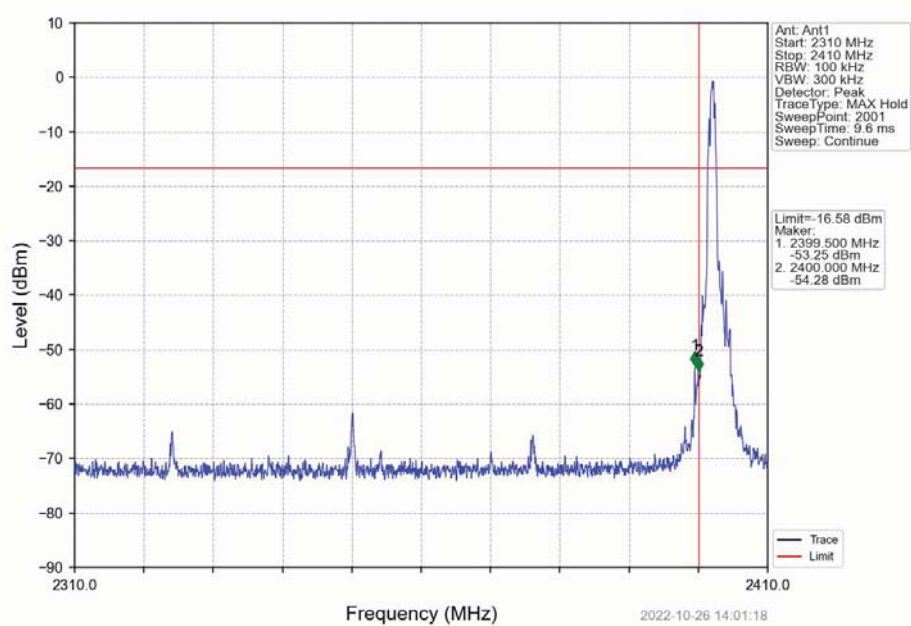
GFSK\_DH5\_HOPP\_Ant1\_NTNV



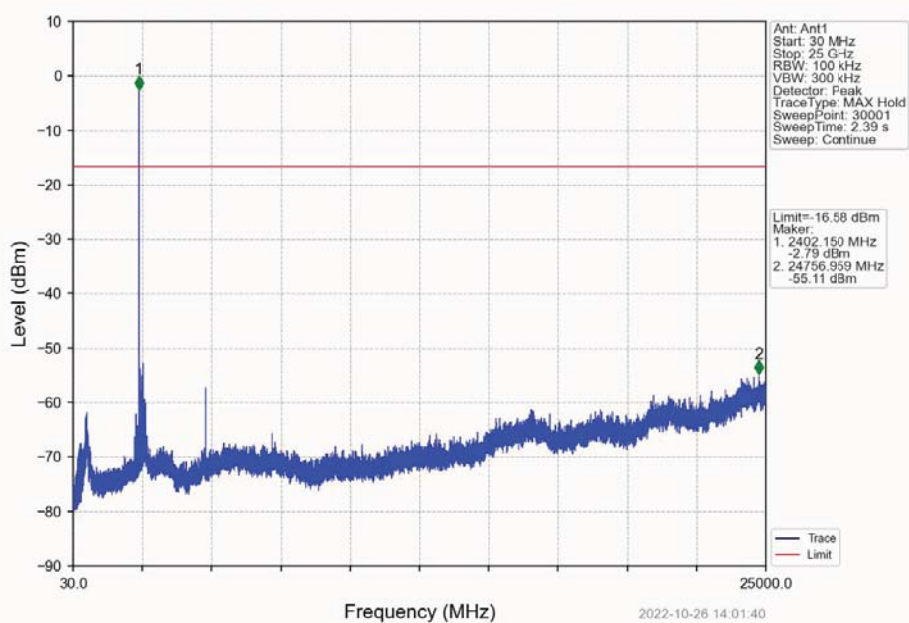
## GFSK\_DH5\_HOPP\_Ant1\_NTNV



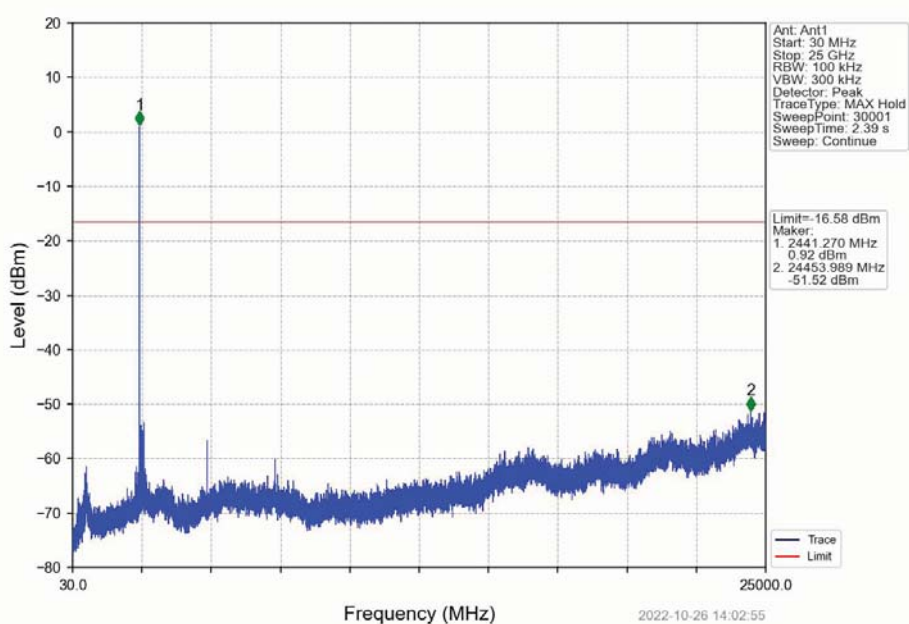
## Pi/4DQPSK\_2DH5\_LCH\_2402MHz\_Ant1\_NTNV



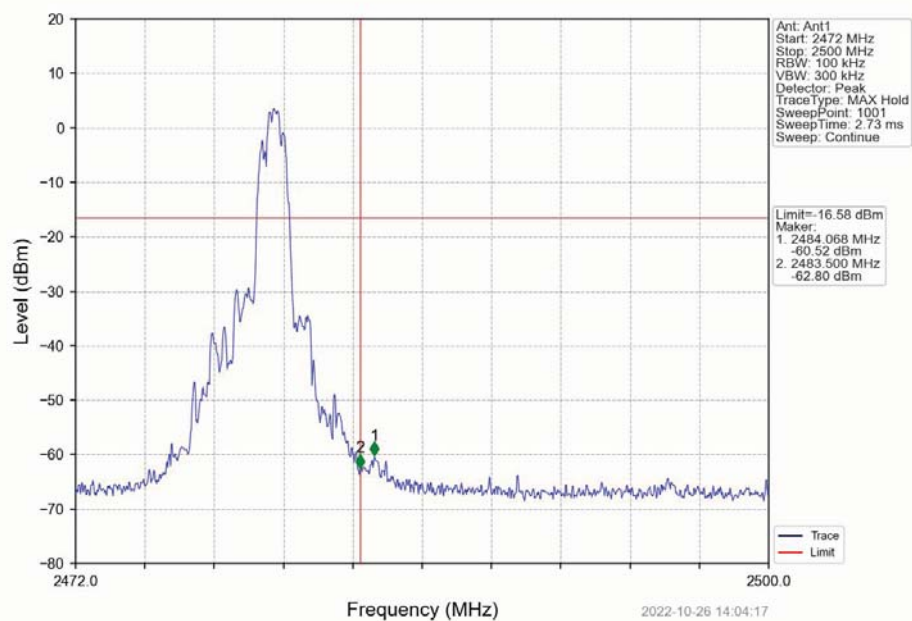
Pi/4DQPSK\_2DH5\_LCH\_2402MHz\_Ant1\_NTNV



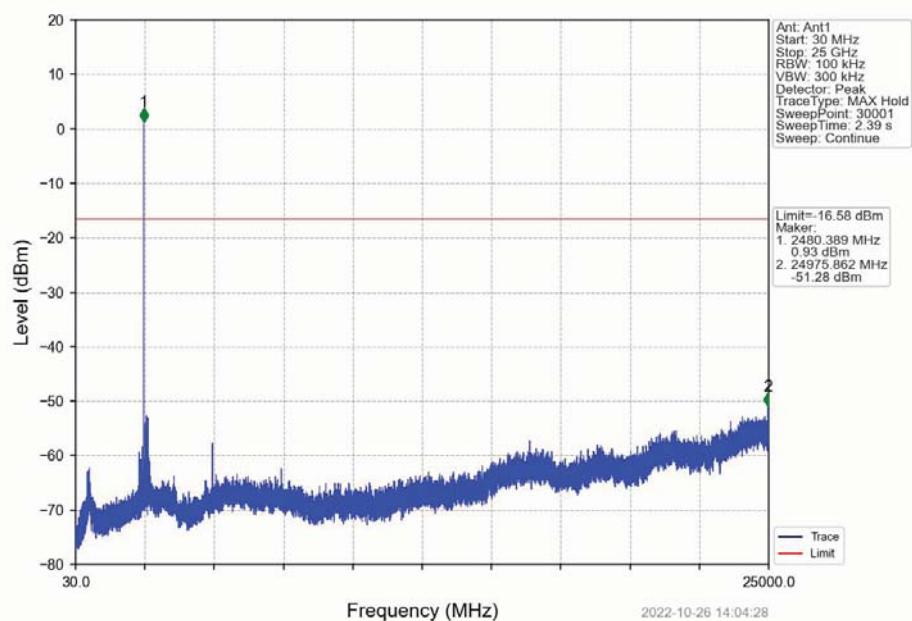
Pi/4DQPSK\_2DH5\_MCH\_2441MHz\_Ant1\_NTNV



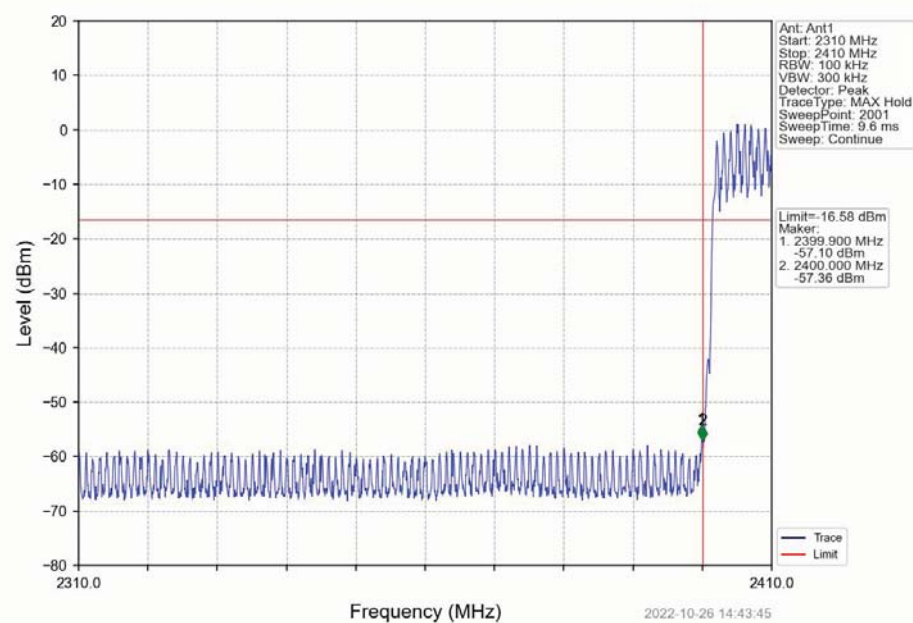
Pi/4DQPSK\_2DH5\_HCH\_2480MHz\_Ant1\_NTNV



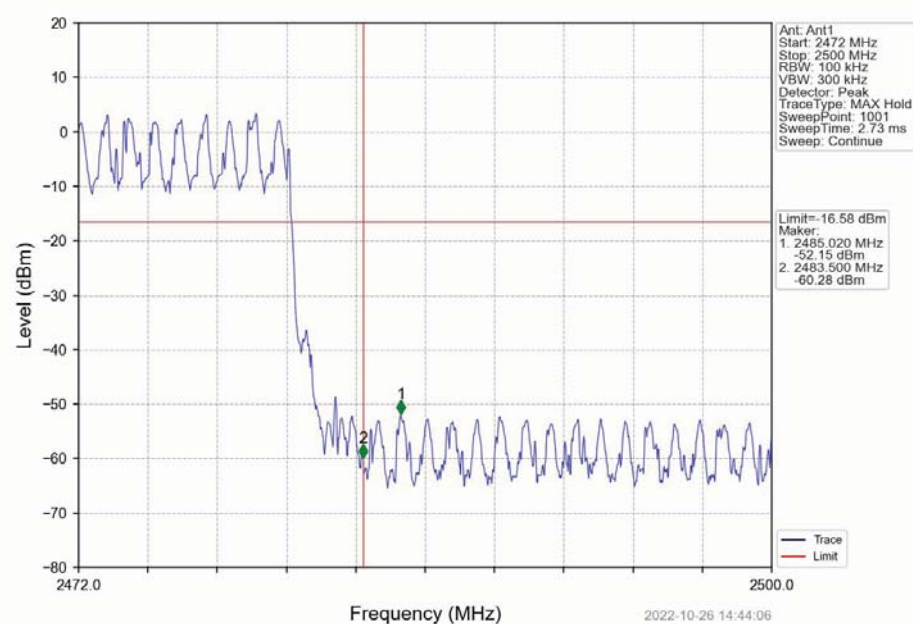
Pi/4DQPSK\_2DH5\_HCH\_2480MHz\_Ant1\_NTNV



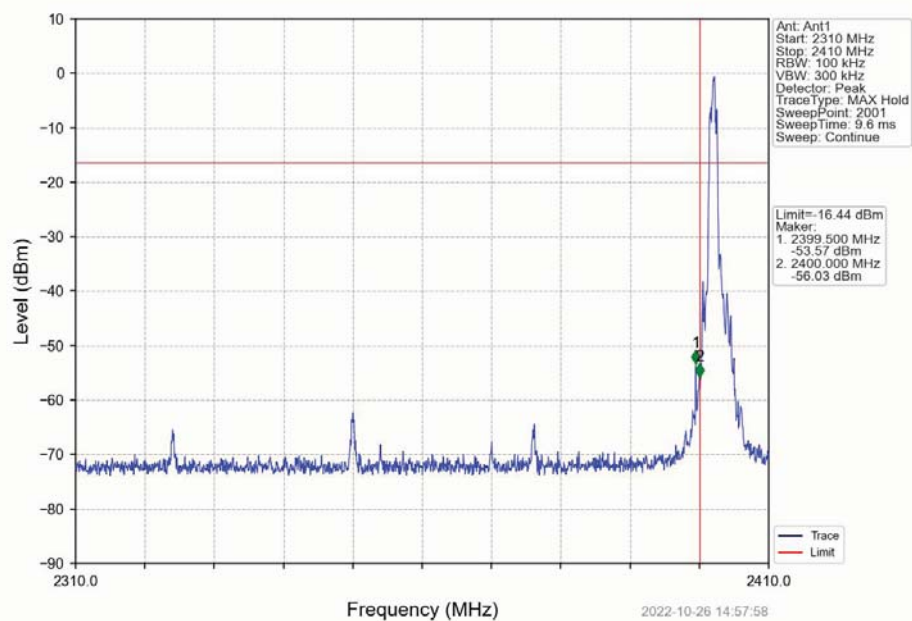
Pi/4DQPSK\_2DH5\_HOPP\_Ant1\_NTNV



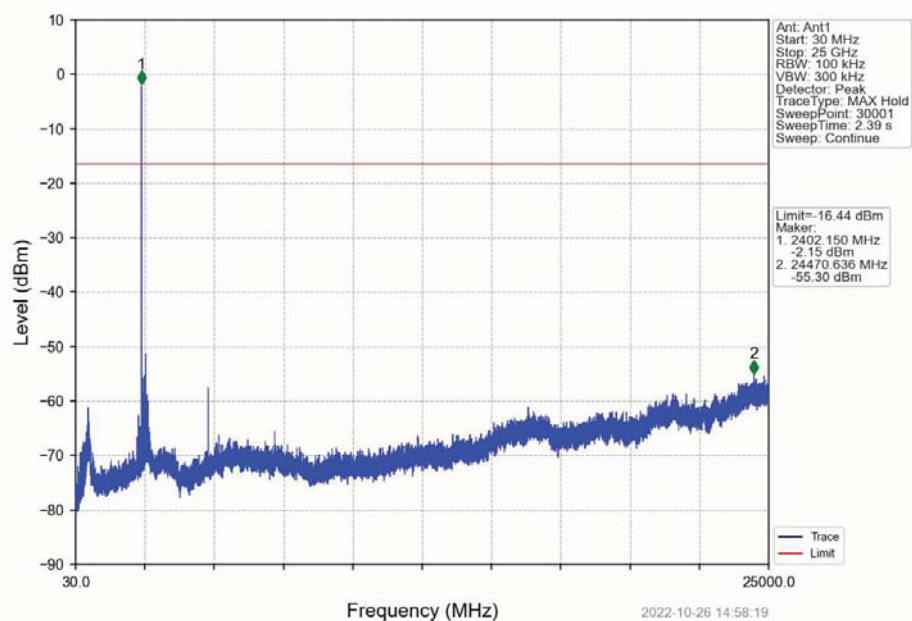
Pi/4DQPSK\_2DH5\_HOPP\_Ant1\_NTNV



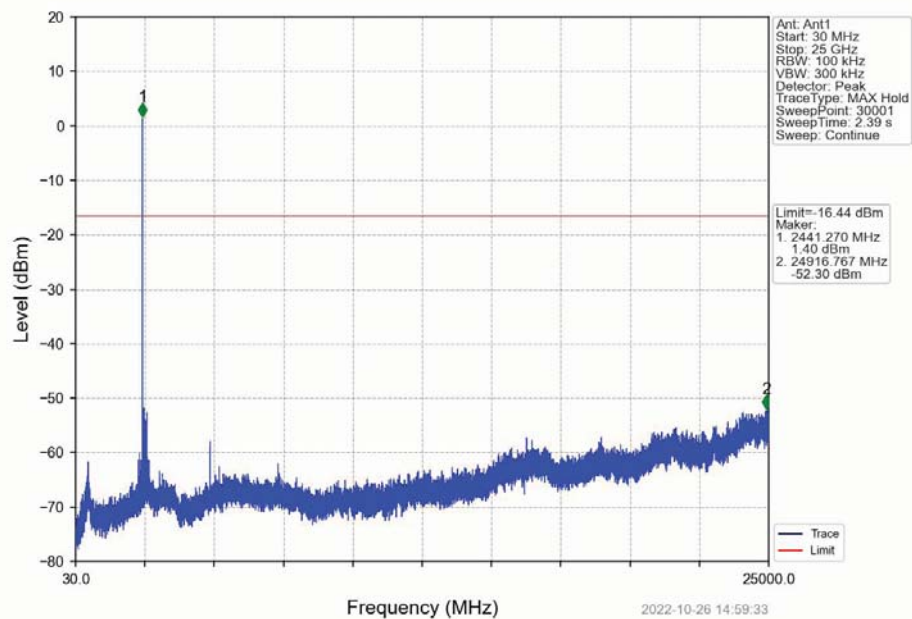
8DPSK\_3DH5\_LCH\_2402MHz\_Ant1\_NTNV



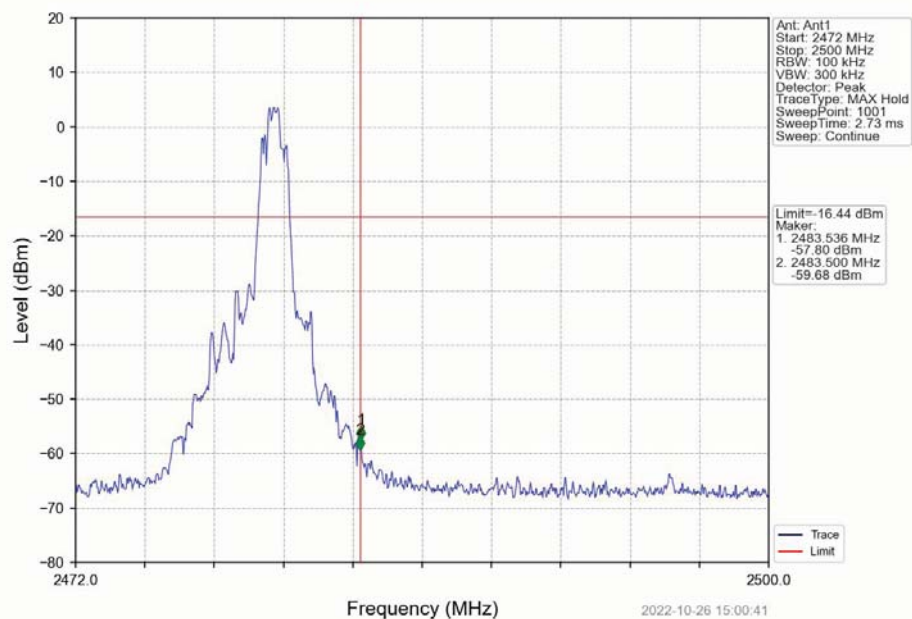
8DPSK\_3DH5\_LCH\_2402MHz\_Ant1\_NTNV



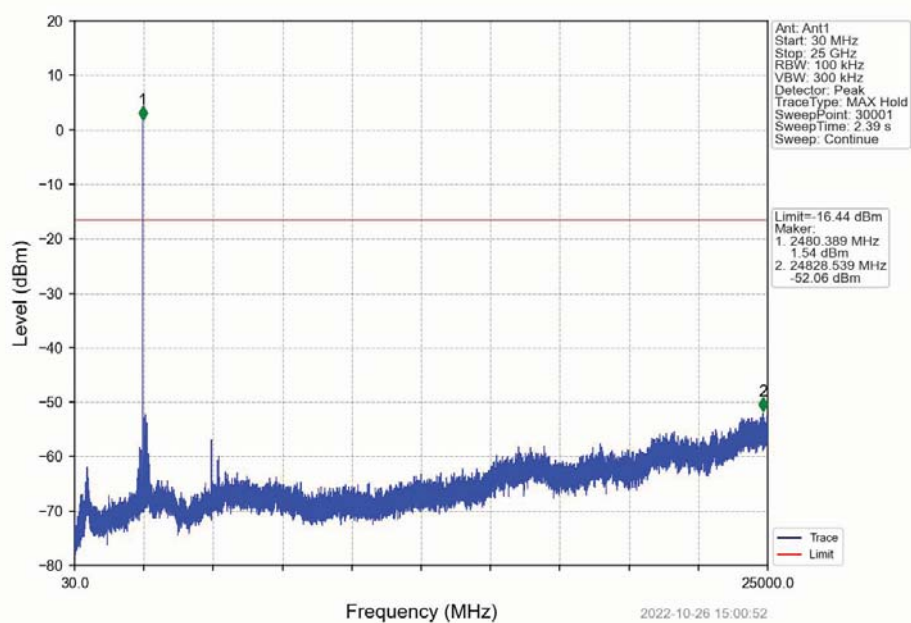
8DPSK\_3DH5\_MCH\_2441MHz\_Ant1\_NTNV



8DPSK\_3DH5\_HCH\_2480MHz\_Ant1\_NTNV



## 8DPSK\_3DH5\_HCH\_2480MHz\_Ant1\_NTNV



## 8DPSK\_3DH5\_HOPP\_Ant1\_NTNV

