



Shenzhen CTL Testing Technology Co., Ltd.

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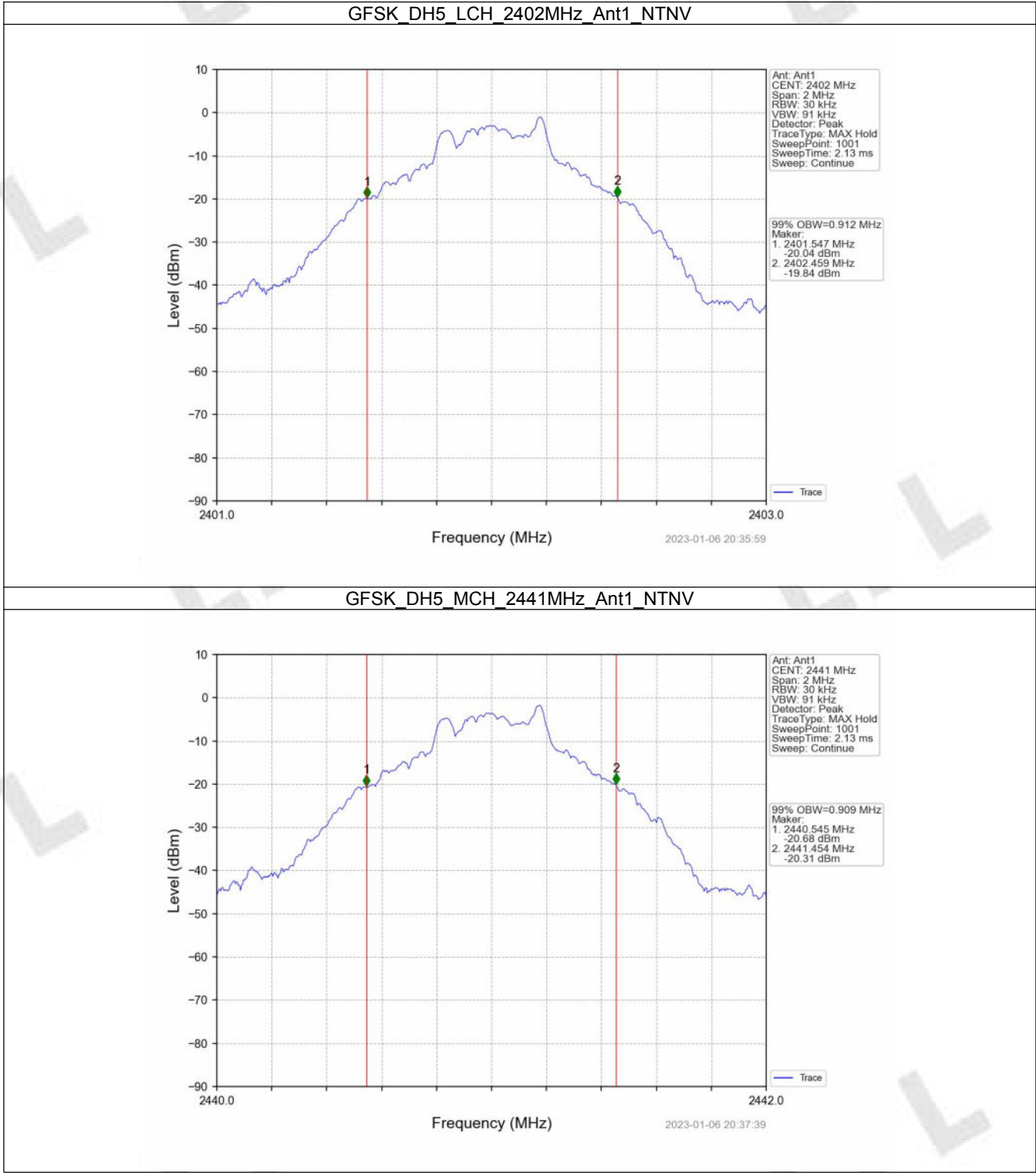
## 1. Bandwidth

### 1.1 OBW

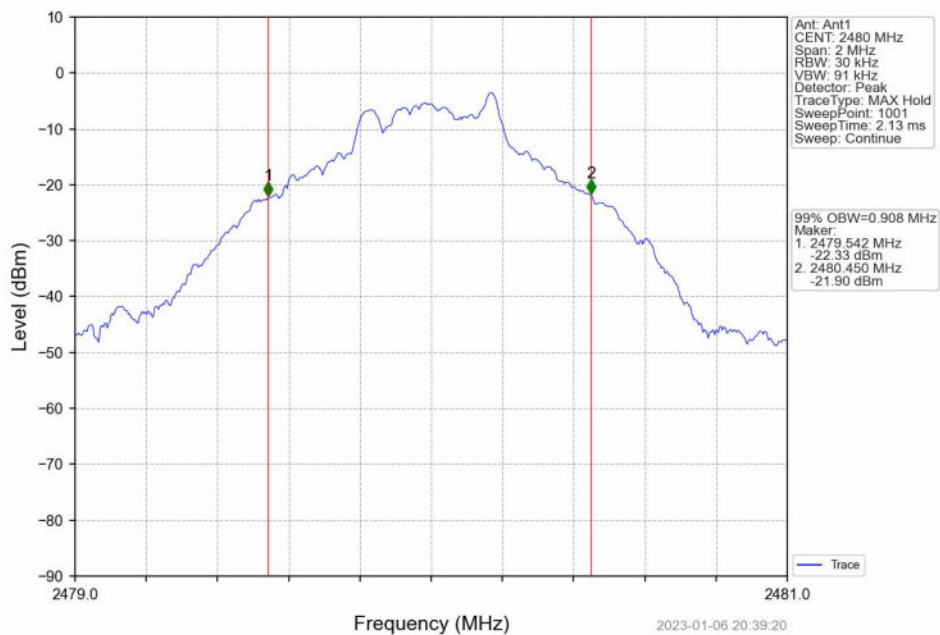
#### 1.1.1 Test Result

| Mode      | TX Type | Frequency (MHz) | Packet Type | ANT | 99% Occupied Bandwidth (MHz) | Verdict |
|-----------|---------|-----------------|-------------|-----|------------------------------|---------|
|           |         |                 |             |     | Result                       |         |
| GFSK      | SISO    | 2402            | DH5         | 1   | 0.912                        | Pass    |
|           |         | 2441            | DH5         | 1   | 0.909                        | Pass    |
|           |         | 2480            | DH5         | 1   | 0.908                        | Pass    |
| Pi/4DQPSK | SISO    | 2402            | 2DH5        | 1   | 0.915                        | Pass    |
|           |         | 2441            | 2DH5        | 1   | 0.918                        | Pass    |
|           |         | 2480            | 2DH5        | 1   | 0.916                        | Pass    |
| 8DPSK     | SISO    | 2402            | 3DH5        | 1   | 1.182                        | Pass    |
|           |         | 2441            | 3DH5        | 1   | 1.183                        | Pass    |
|           |         | 2480            | 3DH5        | 1   | 1.181                        | Pass    |

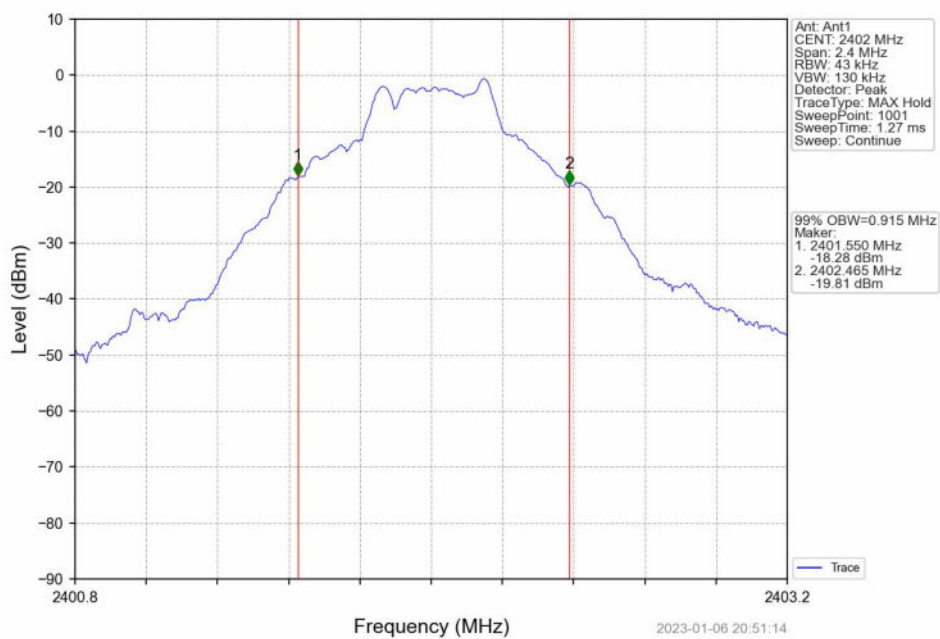
1.1.2 Test Graph



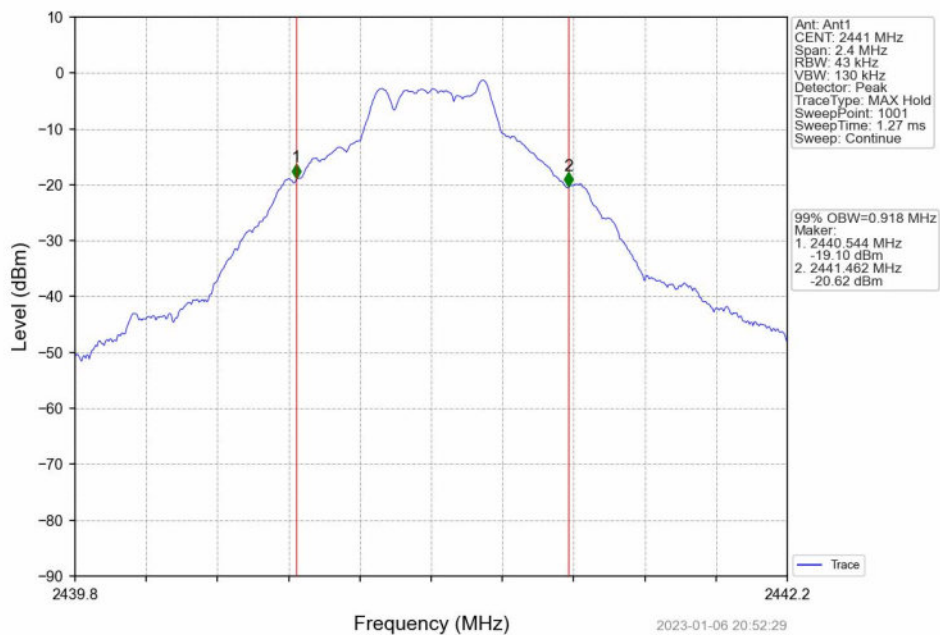
GFSK DH5\_HCH\_2480MHz\_Ant1\_NTNV



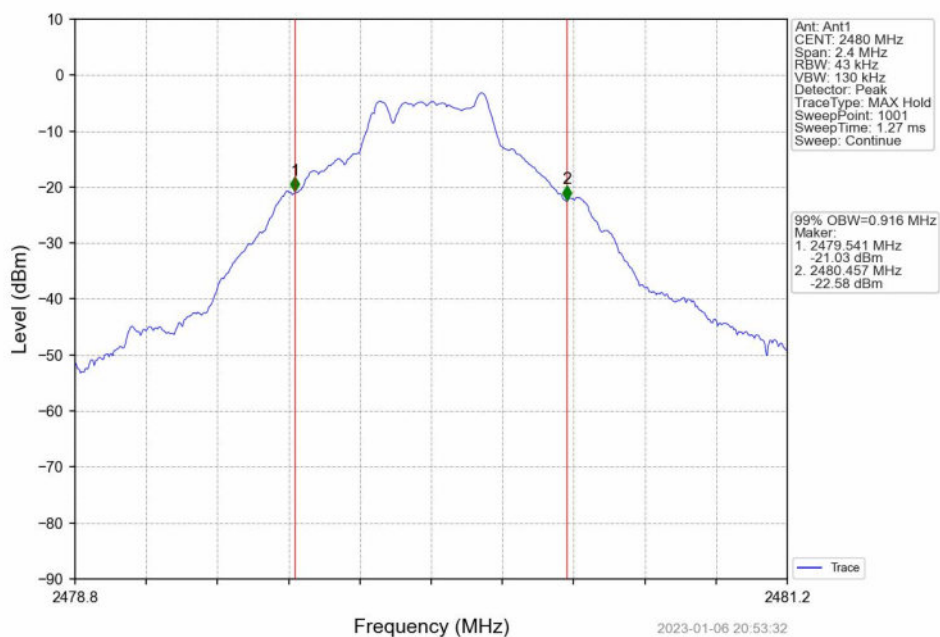
Pi/4DQPSK\_2DH5\_LCH\_2402MHz\_Ant1\_NTNV



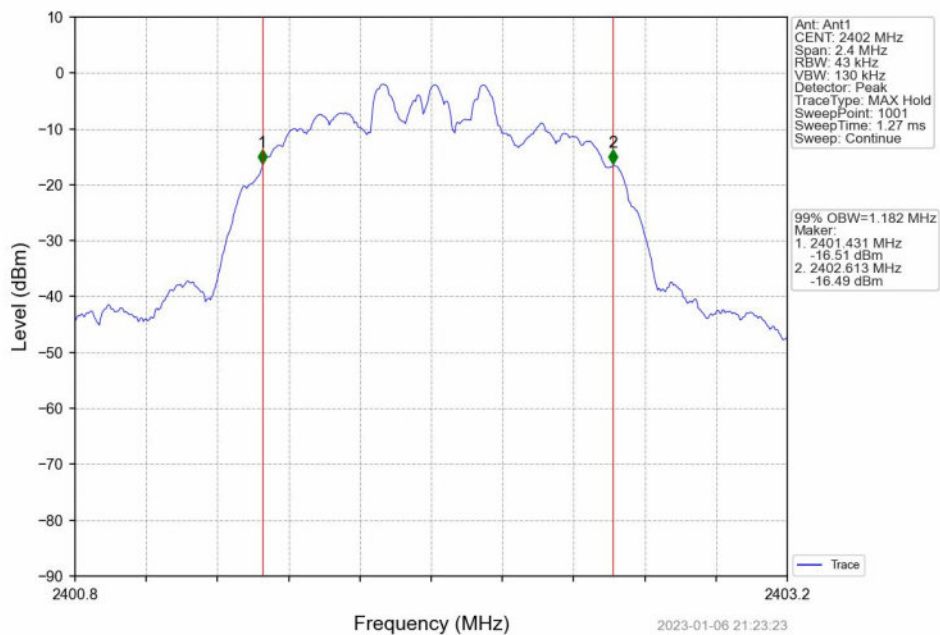
Pi/4DQPSK\_2DH5\_MCH\_2441MHz\_Ant1\_NTNV



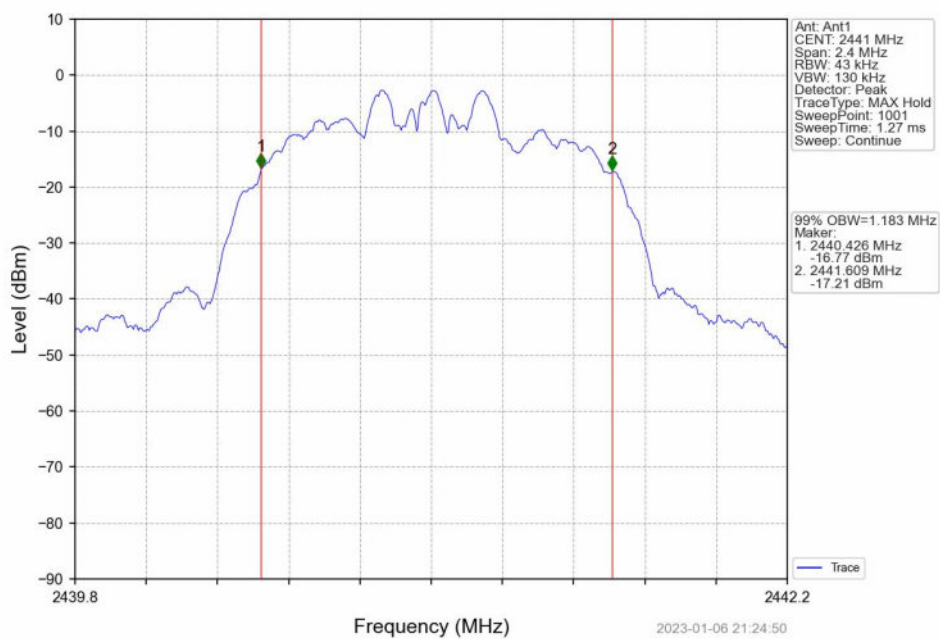
Pi/4DQPSK\_2DH5\_HCH\_2480MHz\_Ant1\_NTNV

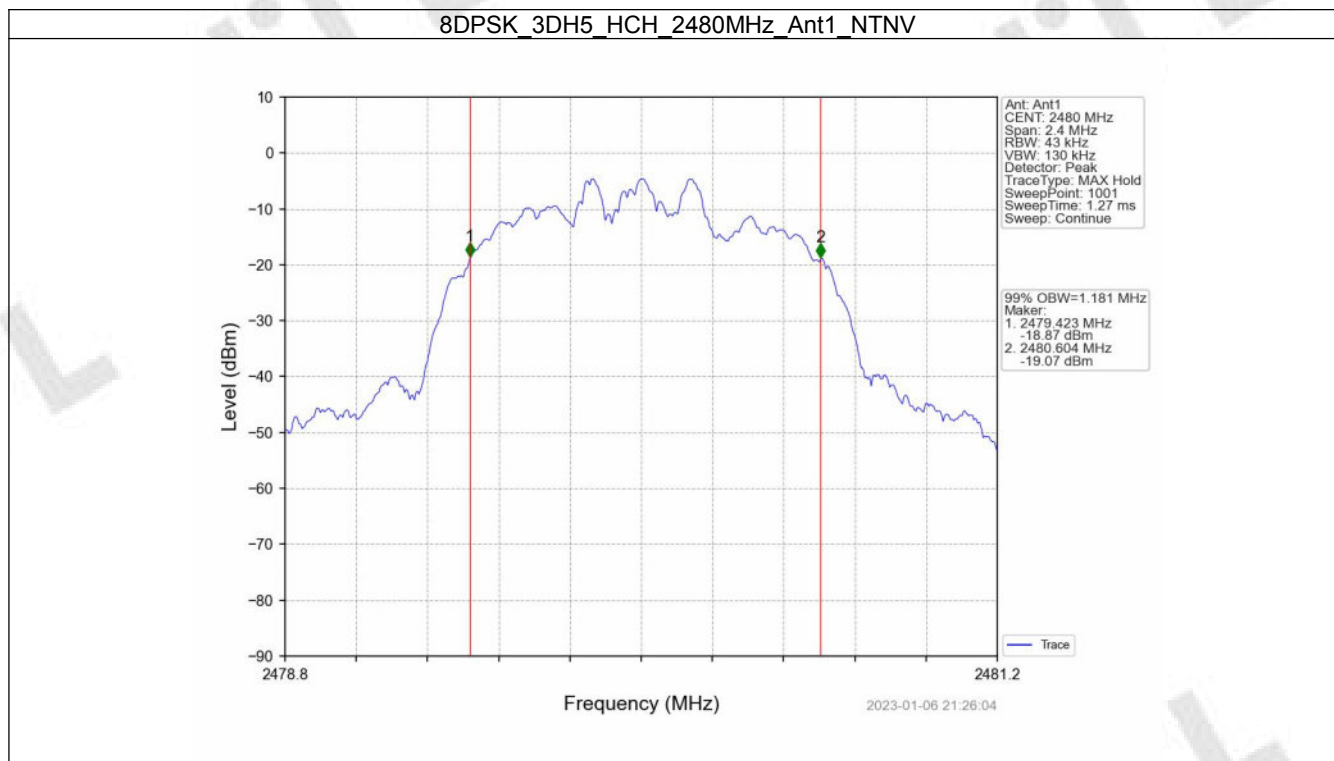


8DPSK\_3DH5\_LCH\_2402MHz\_Ant1\_NTNV



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



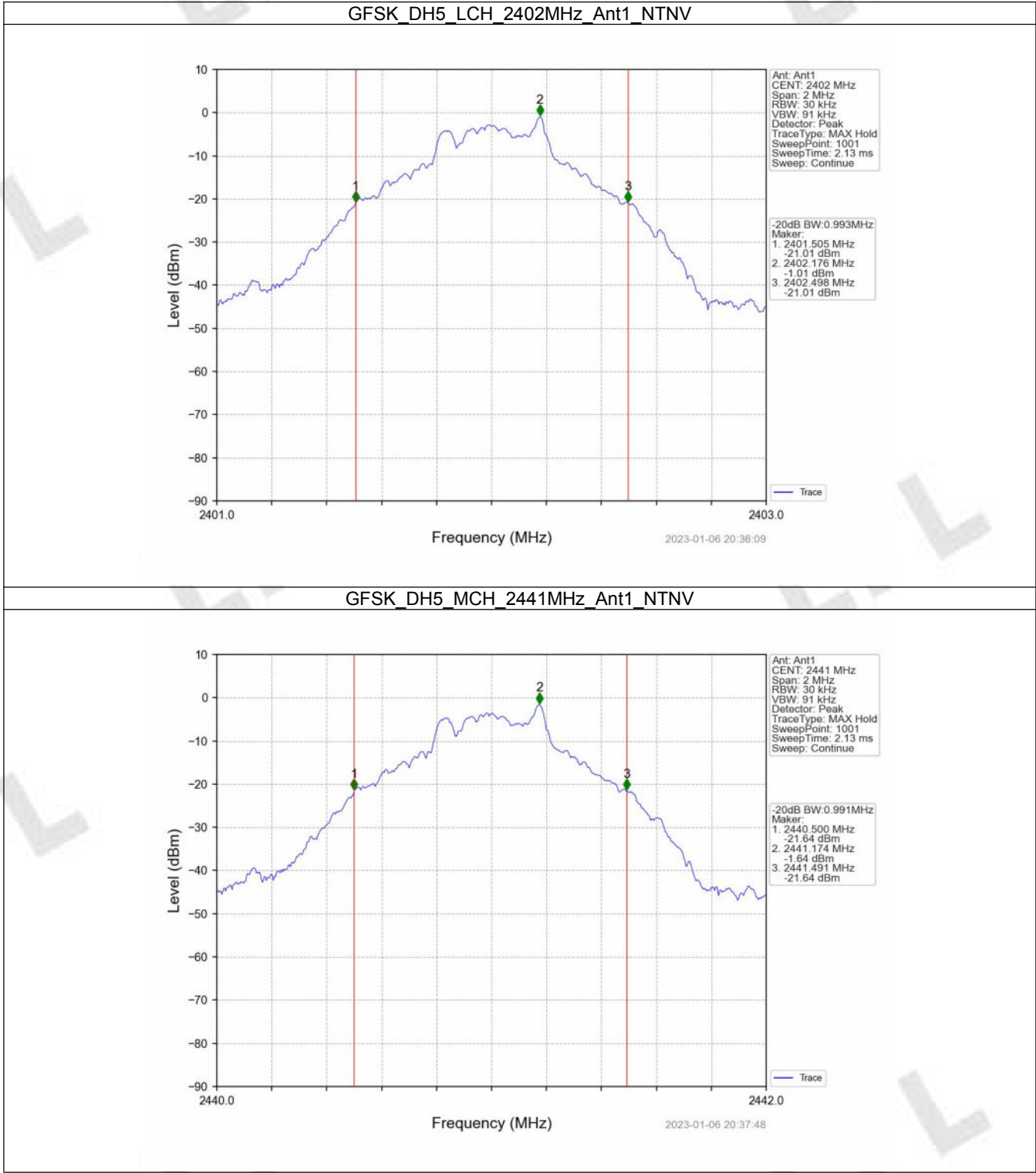


## 1.2 20dB BW

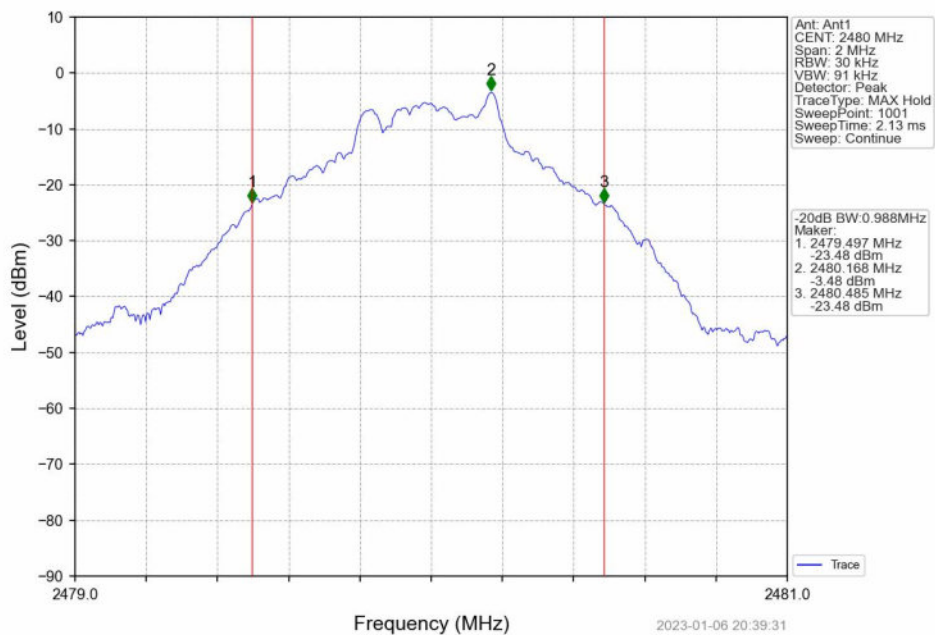
## 1.2.1 Test Result

| Mode      | TX Type | Frequency (MHz) | Packet Type | ANT | 20dB Bandwidth (MHz) | Verdict |
|-----------|---------|-----------------|-------------|-----|----------------------|---------|
|           |         |                 |             |     | Result               |         |
| GFSK      | SISO    | 2402            | DH5         | 1   | 0.993                | Pass    |
|           |         | 2441            | DH5         | 1   | 0.991                | Pass    |
|           |         | 2480            | DH5         | 1   | 0.988                | Pass    |
| Pi/4DQPSK | SISO    | 2402            | 2DH5        | 1   | 1.038                | Pass    |
|           |         | 2441            | 2DH5        | 1   | 1.043                | Pass    |
|           |         | 2480            | 2DH5        | 1   | 1.047                | Pass    |
| 8DPSK     | SISO    | 2402            | 3DH5        | 1   | 1.308                | Pass    |
|           |         | 2441            | 3DH5        | 1   | 1.312                | Pass    |
|           |         | 2480            | 3DH5        | 1   | 1.313                | Pass    |

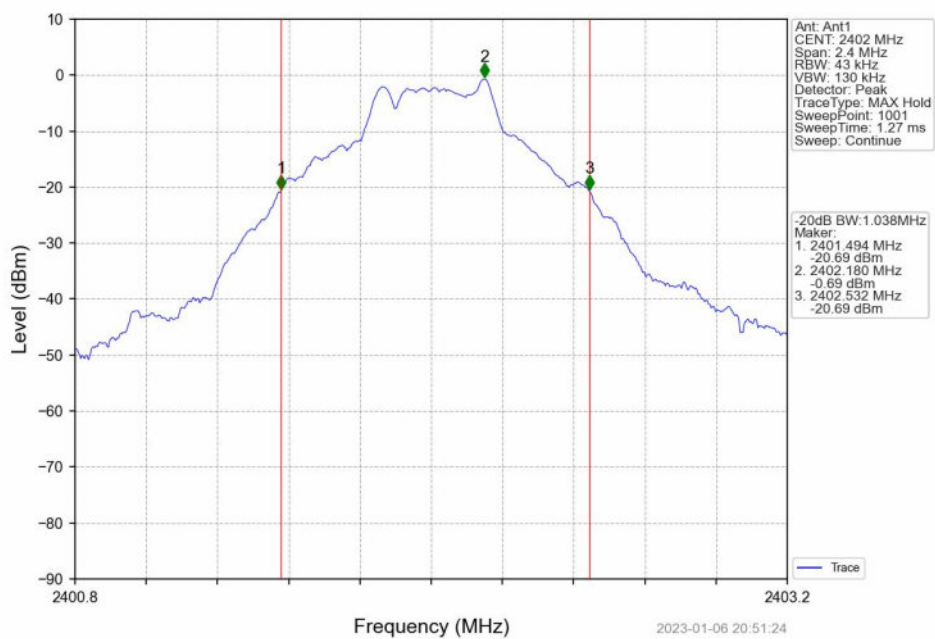
1.2.2 Test Graph



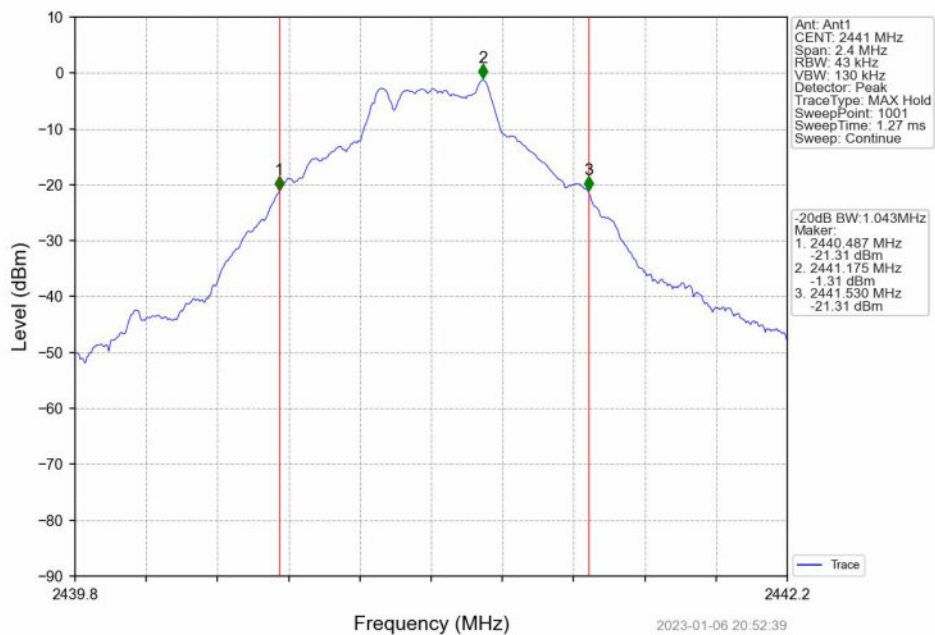
GFSK DH5\_HCH\_2480MHz\_Ant1\_NTNV



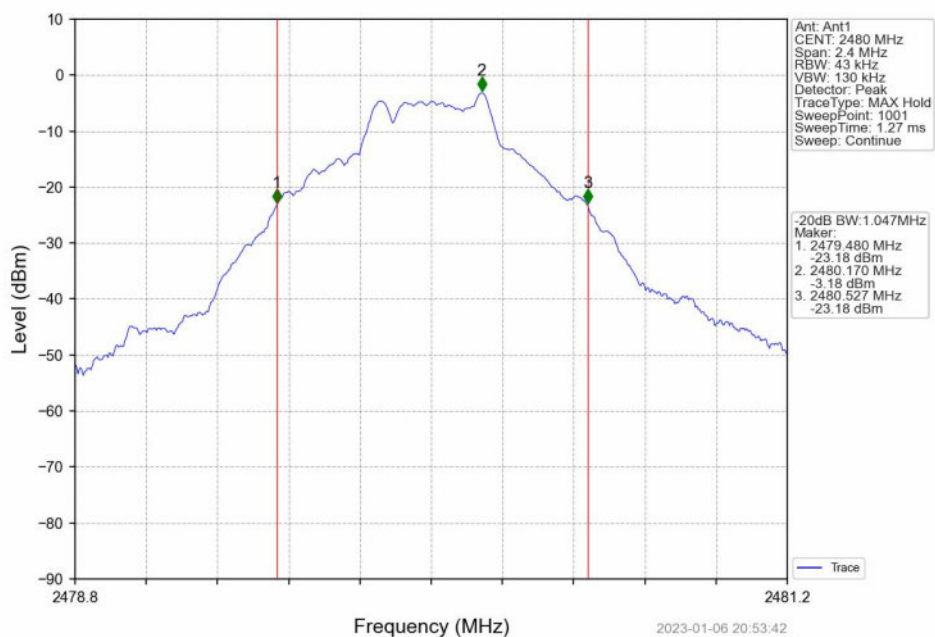
Pi/4DQPSK\_2DH5\_LCH\_2402MHz\_Ant1\_NTNV



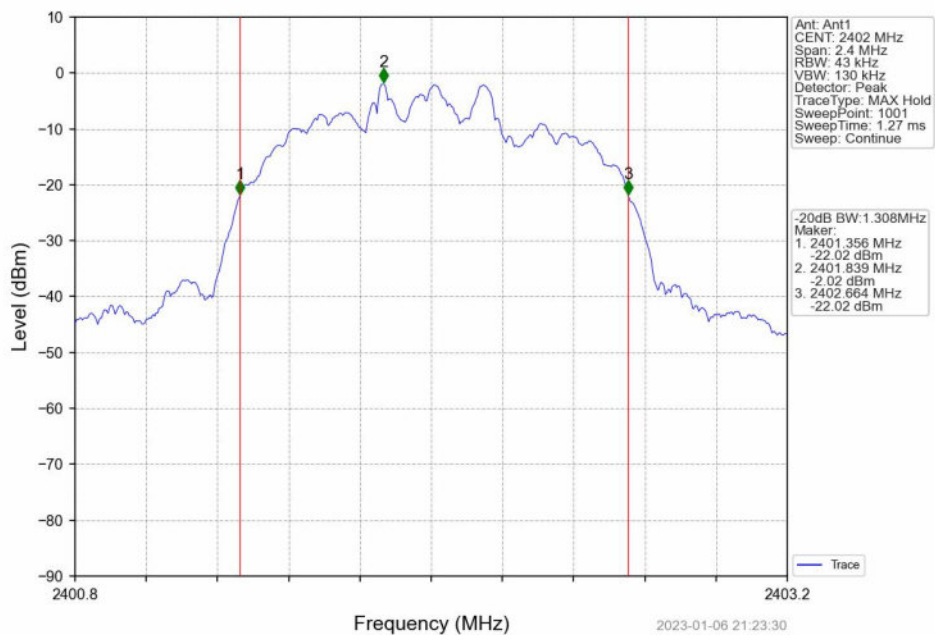
Pi/4DQPSK\_2DH5\_MCH\_2441MHz\_Ant1\_NTNV



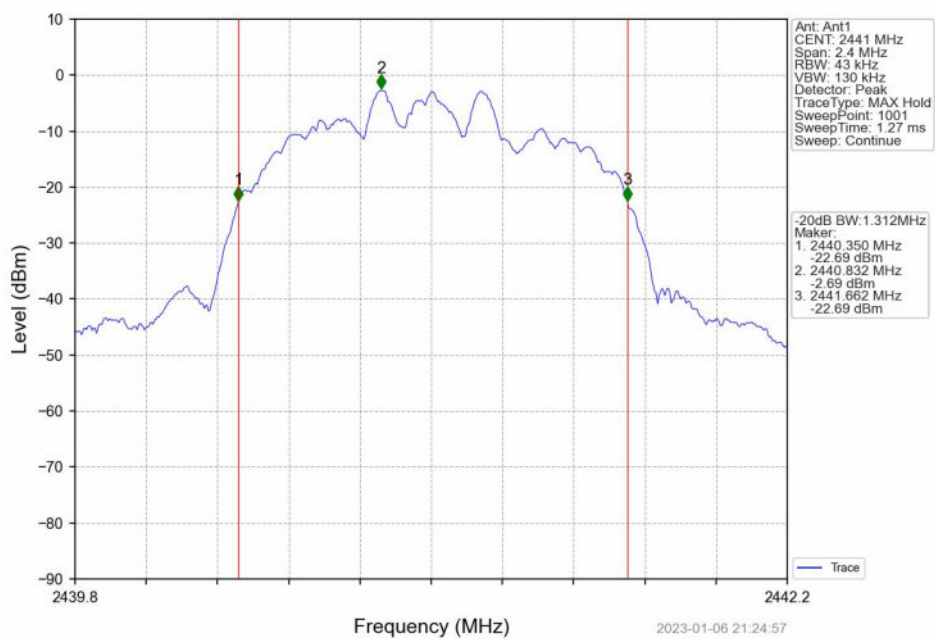
Pi/4DQPSK\_2DH5\_HCH\_2480MHz\_Ant1\_NTNV

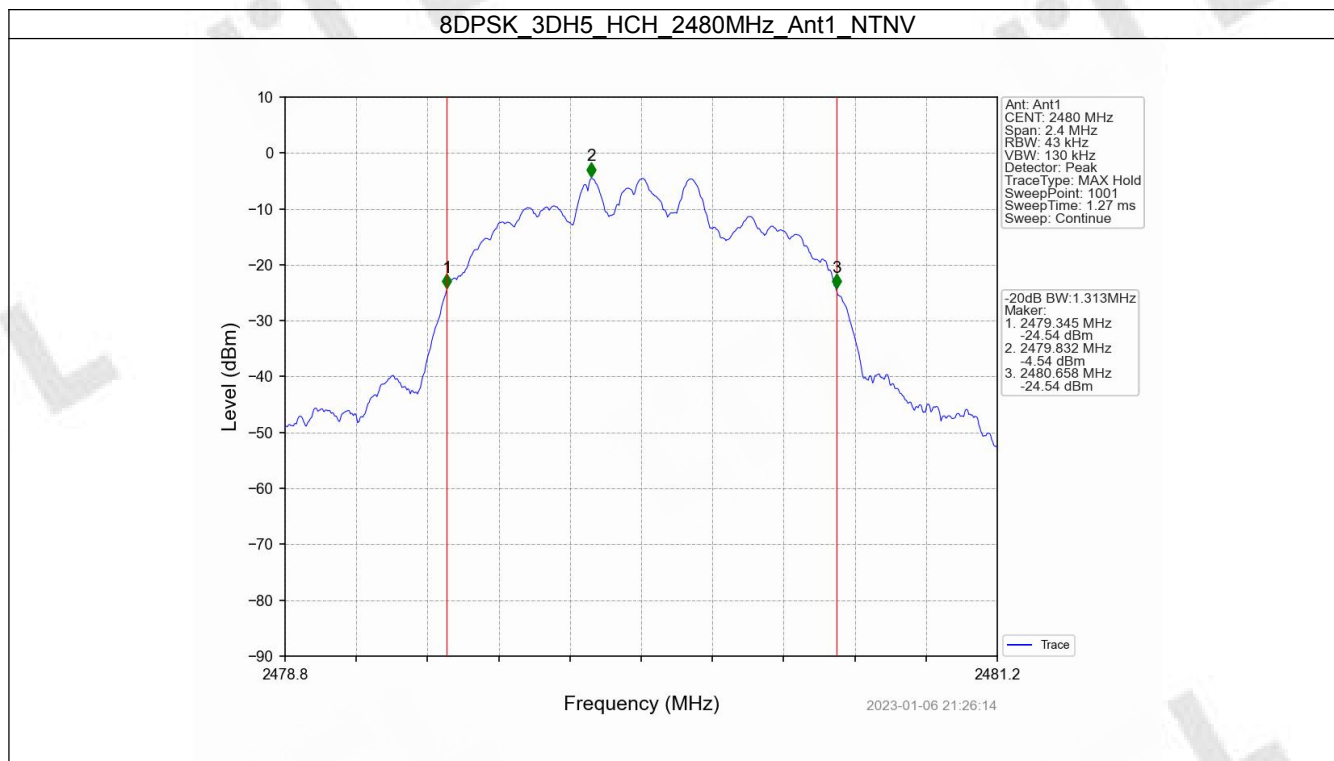


8DPSK\_3DH5\_LCH\_2402MHz\_Ant1\_NTNV



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





## 2. Maximum Conducted Output Power

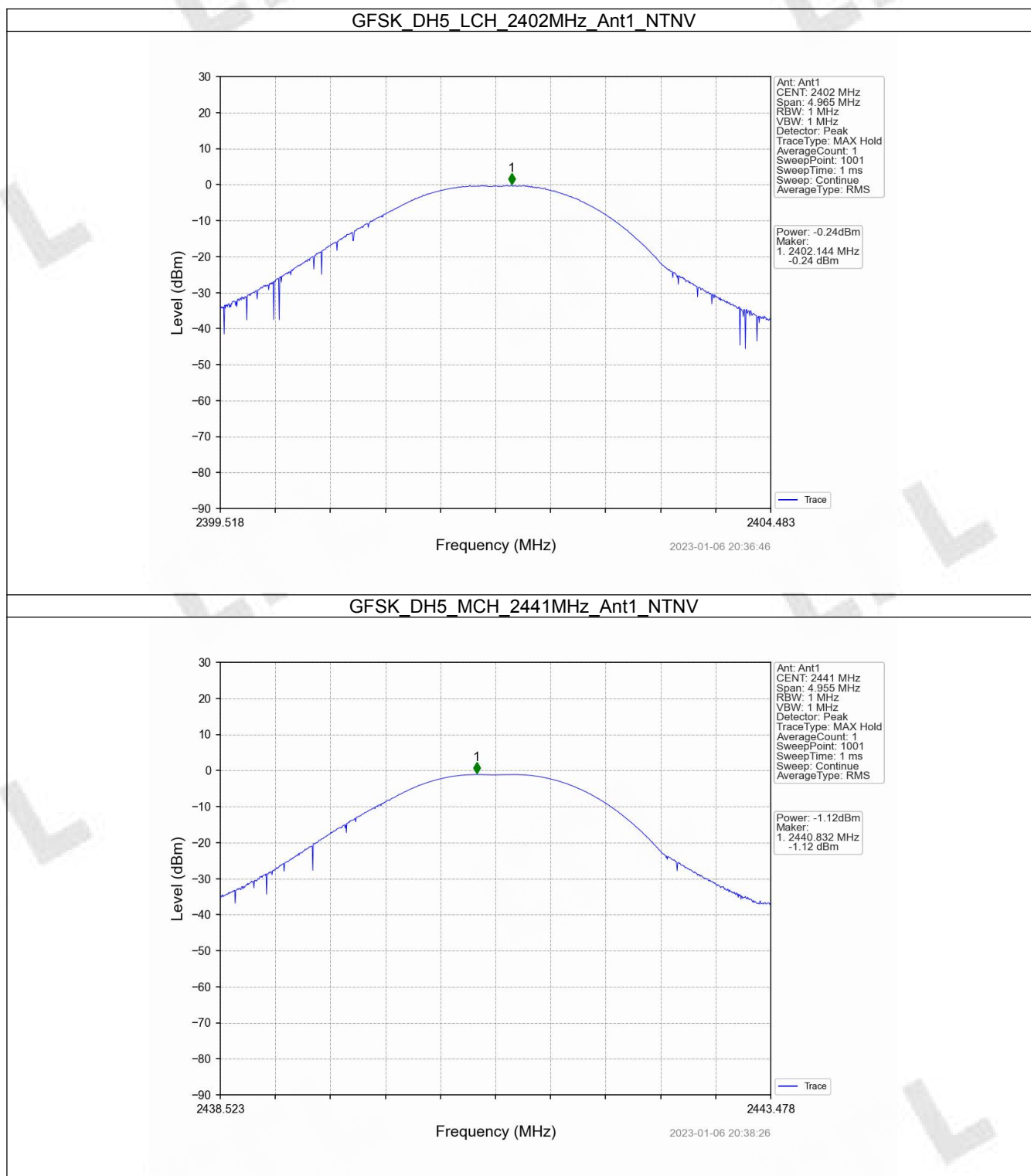
### 2.1 Power

#### 2.1.1 Test Result

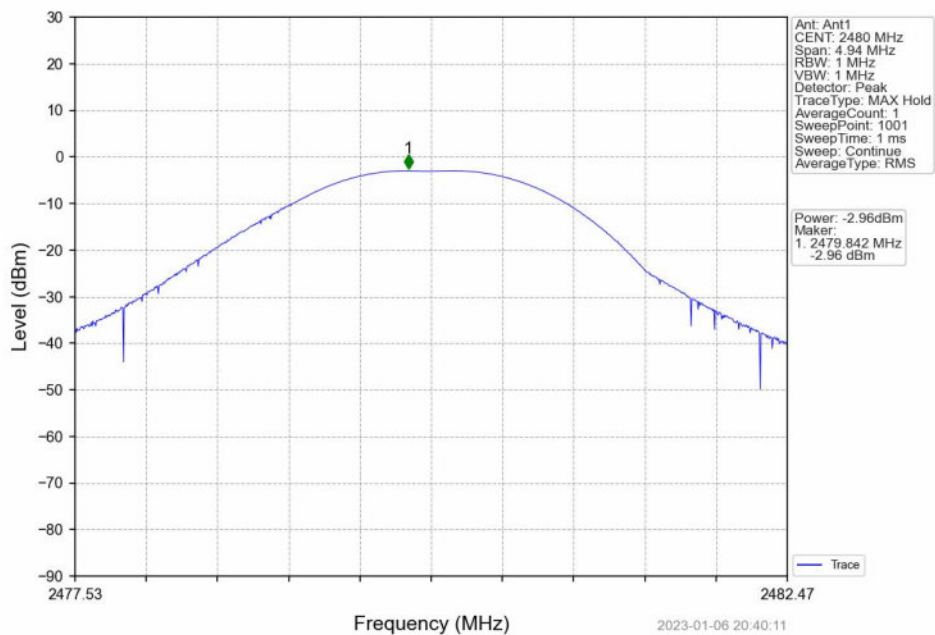
| Mode      | TX Type | Frequency (MHz) | Packet Type | Maximum Peak Conducted Output Power (dBm) |         | Verdict |
|-----------|---------|-----------------|-------------|-------------------------------------------|---------|---------|
|           |         |                 |             | ANT1                                      | Limit   |         |
| GFSK      | SISO    | 2402            | DH5         | -0.24                                     | <=30    | Pass    |
|           |         | 2441            | DH5         | -1.12                                     | <=30    | Pass    |
|           |         | 2480            | DH5         | -2.96                                     | <=30    | Pass    |
| Pi/4DQPSK | SISO    | 2402            | 2DH5        | -0.52                                     | <=20.97 | Pass    |
|           |         | 2441            | 2DH5        | -1.12                                     | <=20.97 | Pass    |
|           |         | 2480            | 2DH5        | -2.95                                     | <=20.97 | Pass    |
| 8DPSK     | SISO    | 2402            | 3DH5        | -0.45                                     | <=20.97 | Pass    |
|           |         | 2441            | 3DH5        | -1.11                                     | <=20.97 | Pass    |
|           |         | 2480            | 3DH5        | -2.91                                     | <=20.97 | Pass    |

Note1: Antenna Gain: Ant1: 3.22dBi;

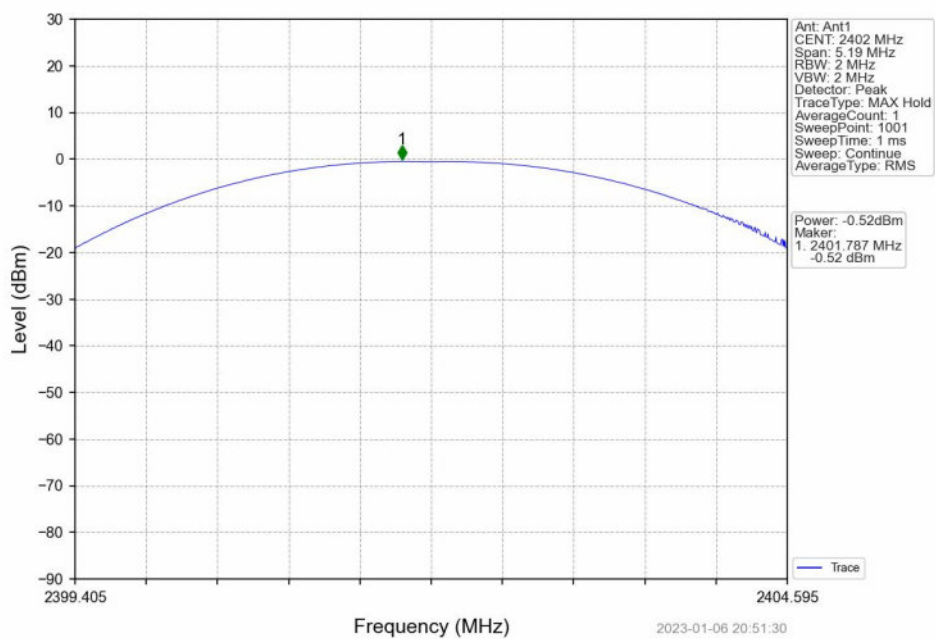
## 2.1.2 Test Graph



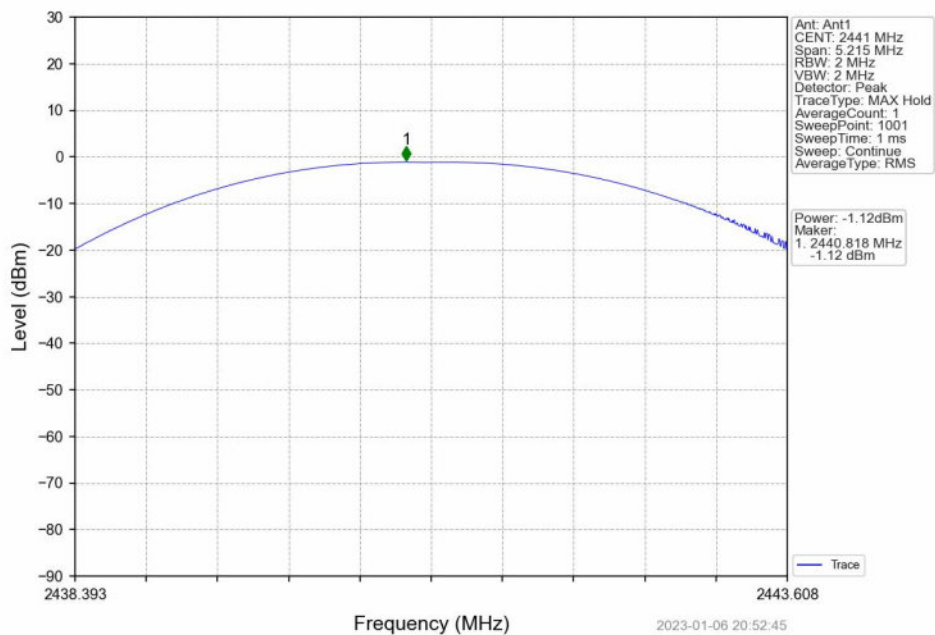
GFSK DH5\_HCH\_2480MHz\_Ant1\_NTNV



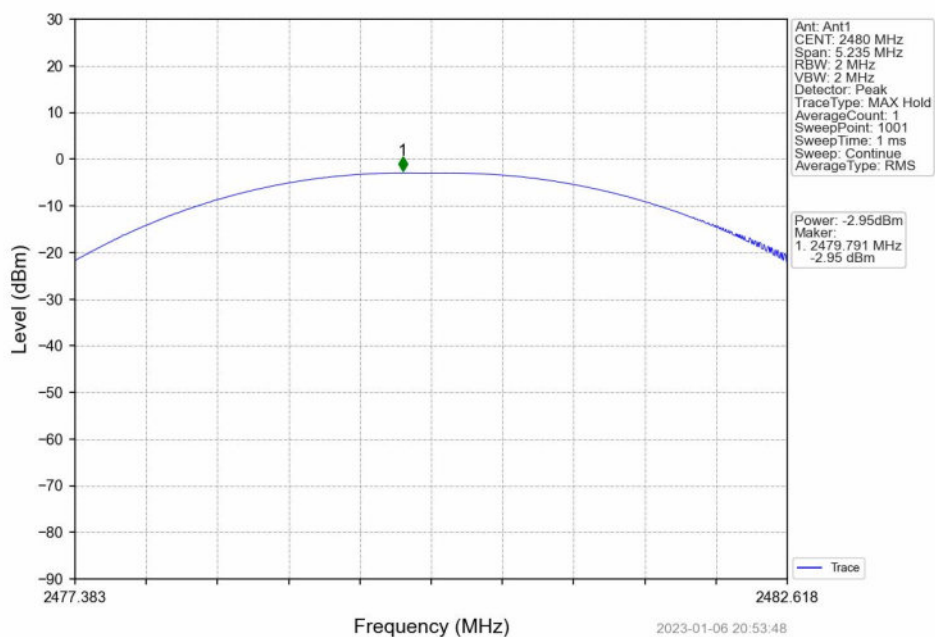
Pi/4DQPSK\_2DH5\_LCH\_2402MHz\_Ant1\_NTNV



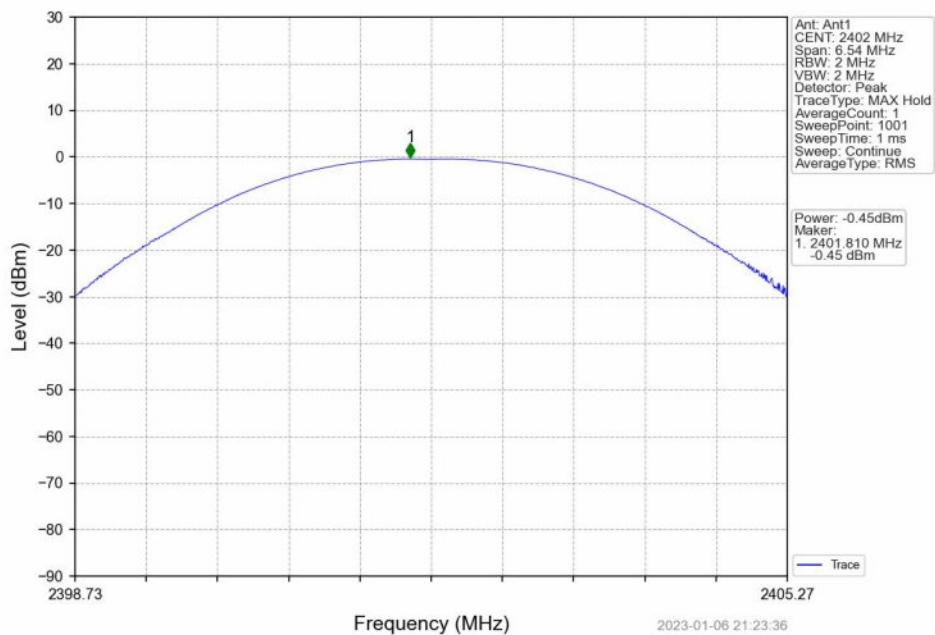
Pi/4DQPSK\_2DH5\_MCH\_2441MHz\_Ant1\_NTNV



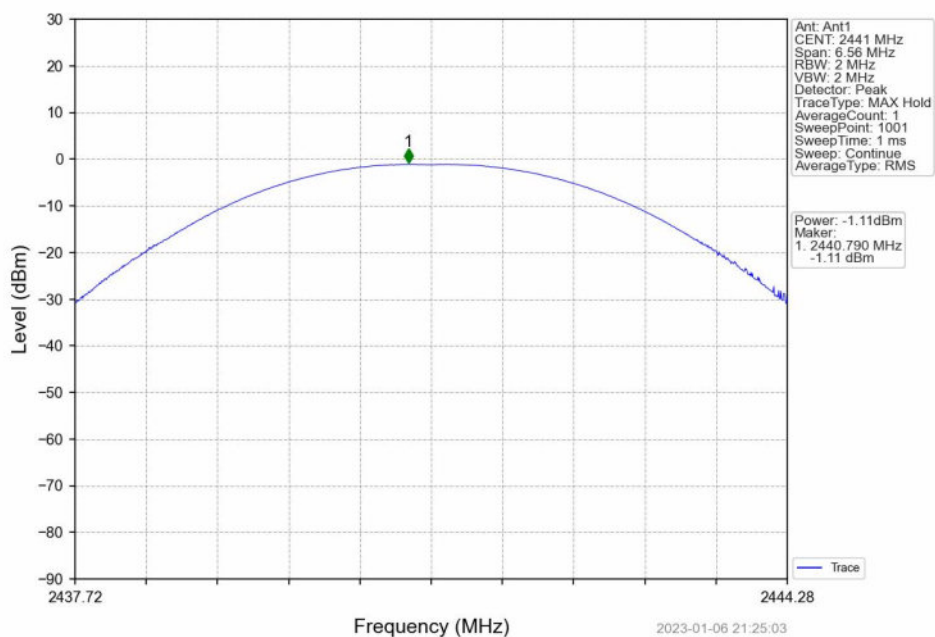
Pi/4DQPSK\_2DH5\_HCH\_2480MHz\_Ant1\_NTNV

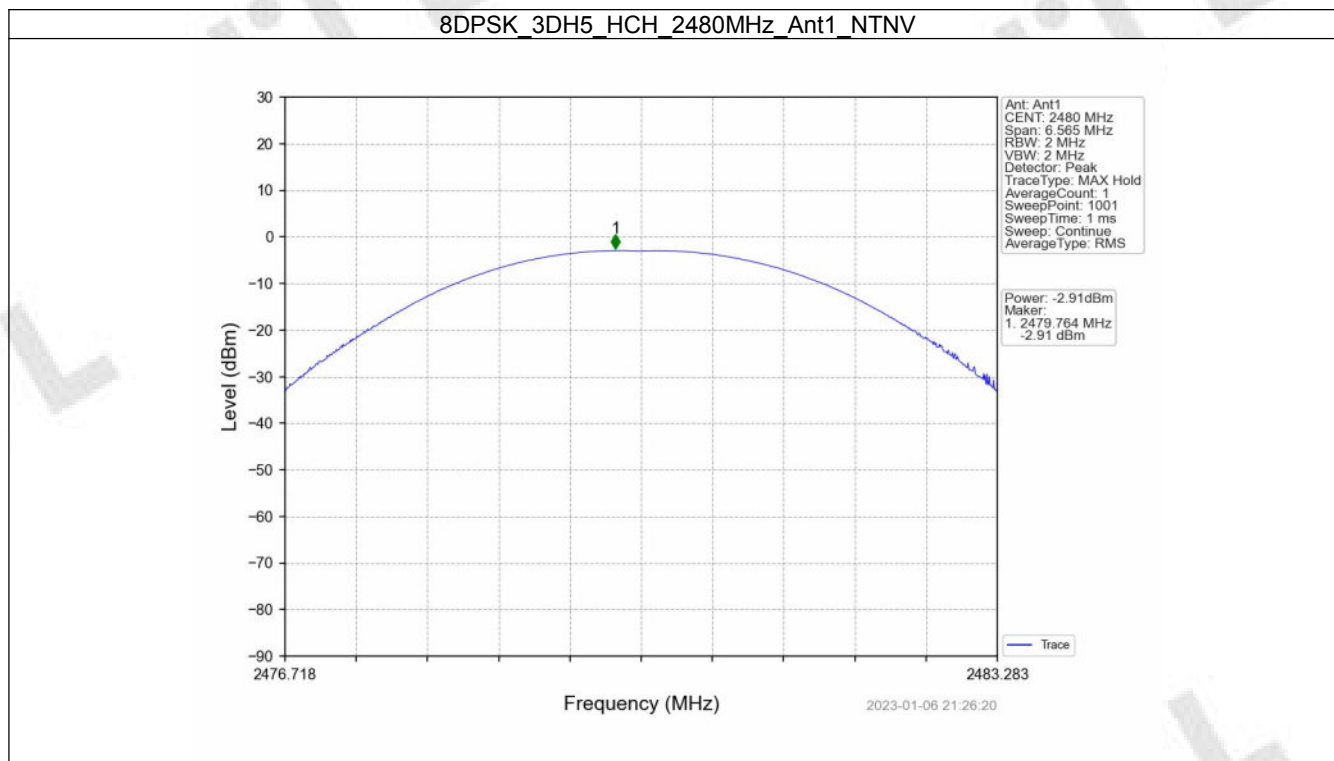


8DPSK\_3DH5\_LCH\_2402MHz\_Ant1\_NTNV



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





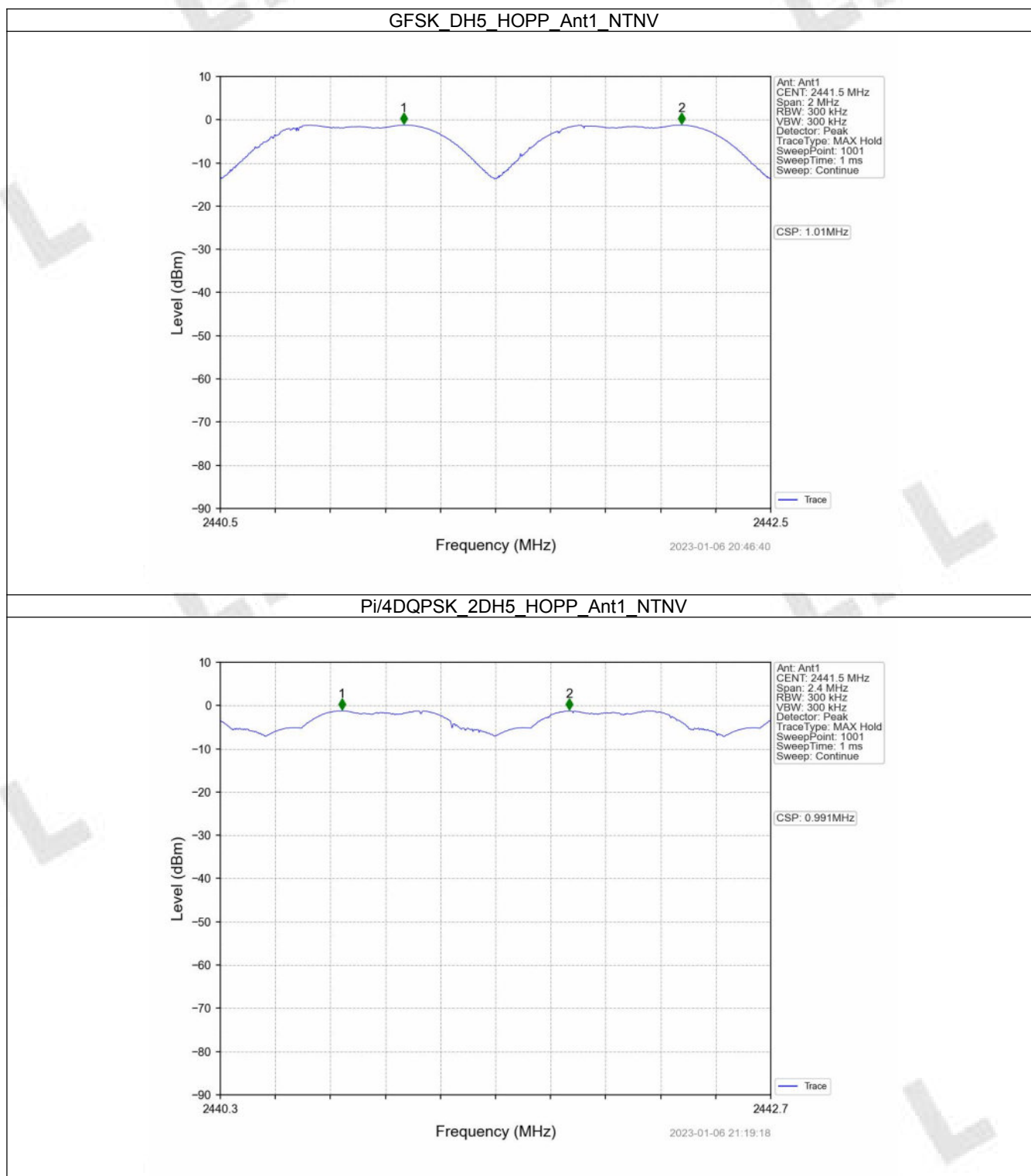
### 3. Carrier Frequency Separation

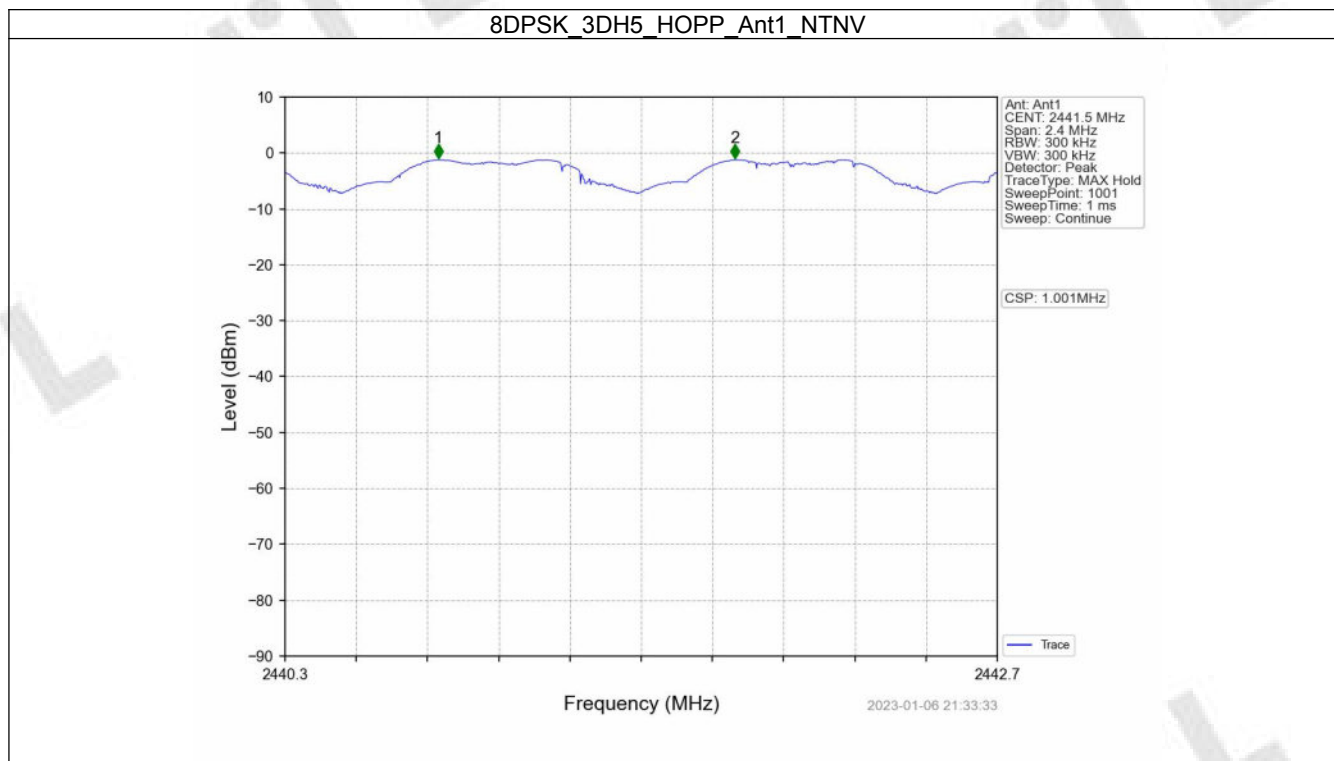
#### 3.1 Ant1

##### 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         | 1.010                    | 0.993                | $\geq 0.993$ | Pass    |
| Pi/4DQPSK | SISO    | HOPP            | 2DH5        | 0.991                    | 1.047                | $\geq 0.698$ | Pass    |
| 8DPSK     | SISO    | HOPP            | 3DH5        | 1.001                    | 1.313                | $\geq 0.875$ | Pass    |

## 3.1.2 Test Graph





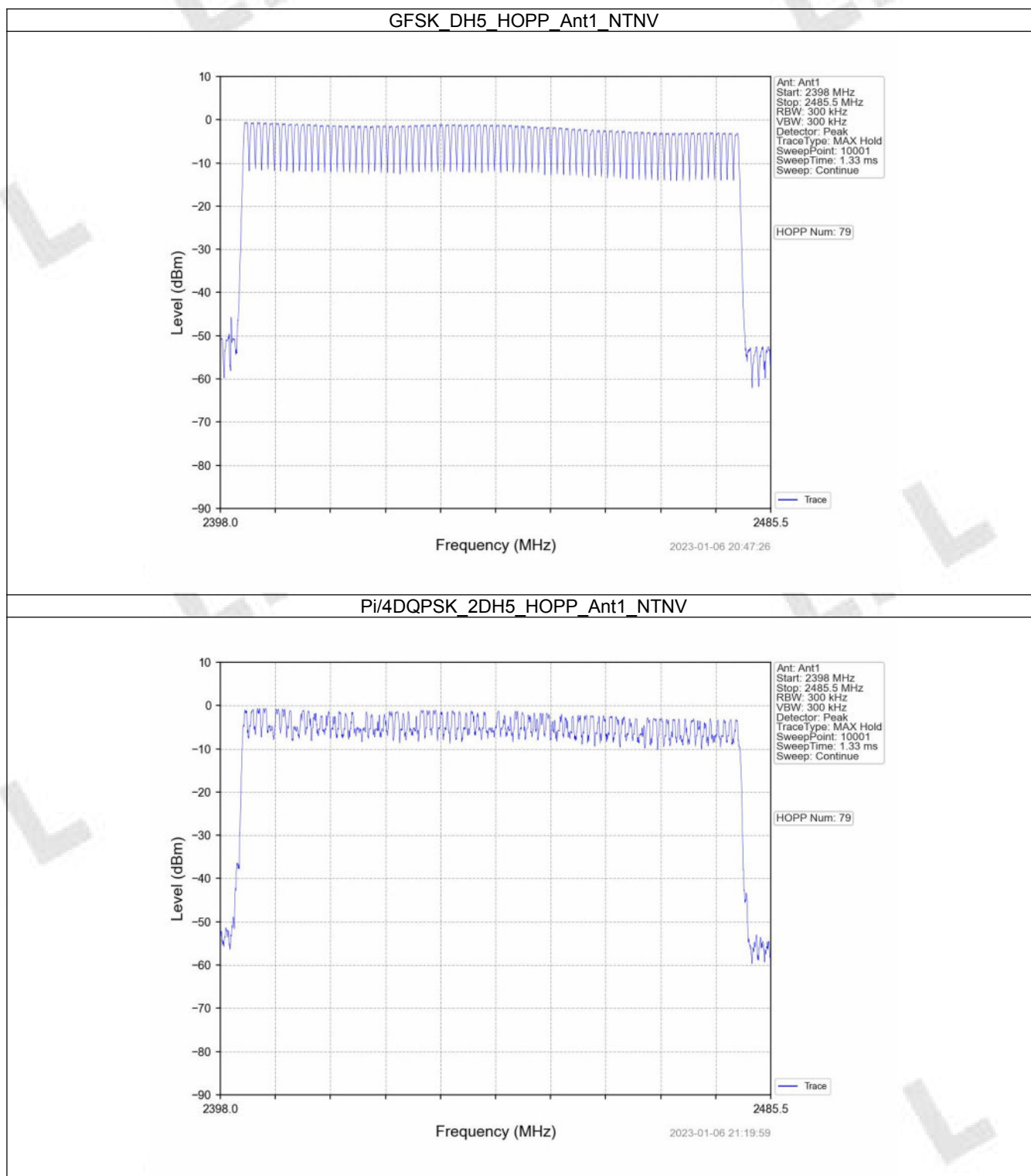
## 4. Number of Hopping Frequencies

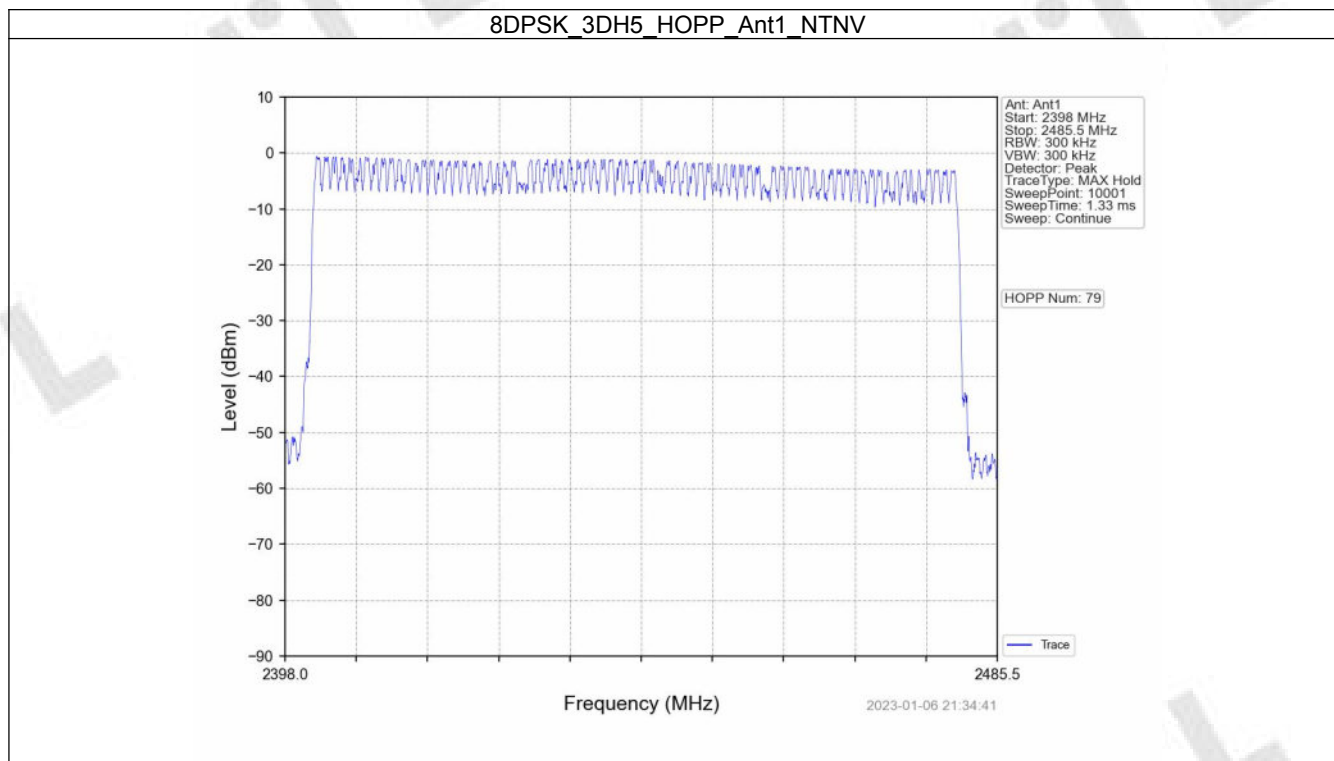
### 4.1 HoppNum

#### 4.1.1 Test Result

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

## 4.1.2 Test Graph





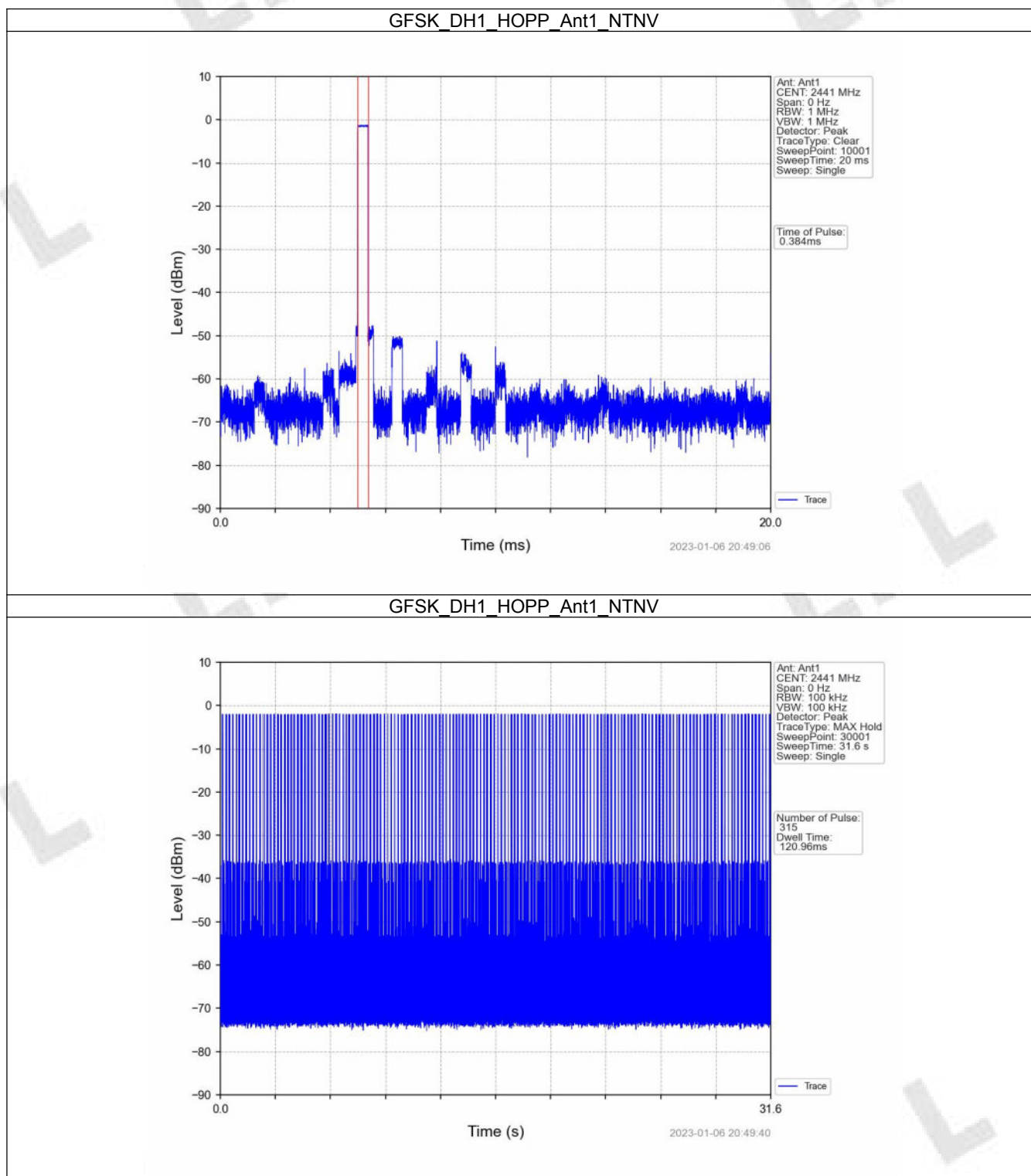
## 5. Time of Occupancy (Dwell Time)

### 5.1 Ant1

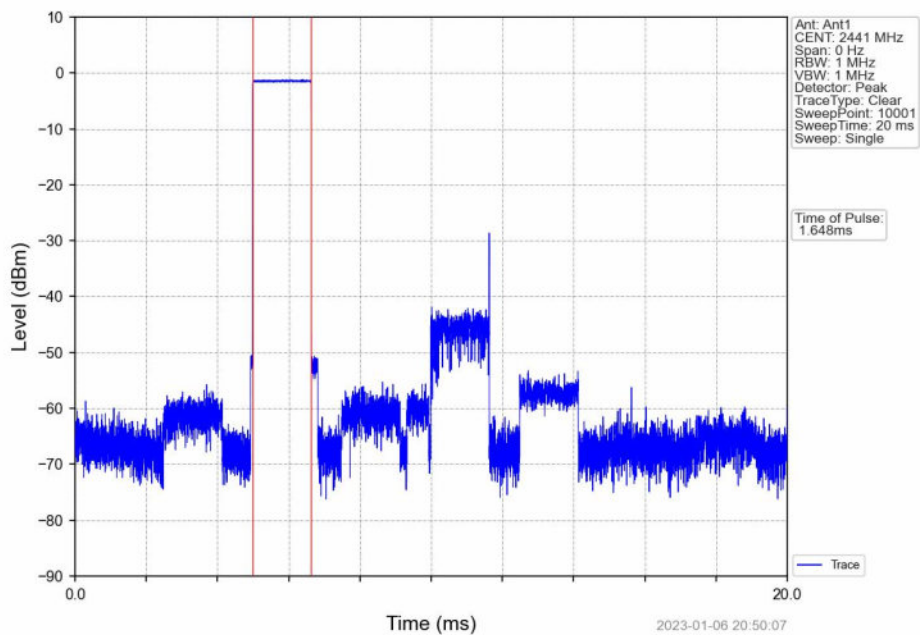
#### 5.1.1 Test Result

| 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         | 0.384                         | 31.600                 | 315                                | 120.960         | <=400      | Pass    |
|           |         |                 | DH3         | 1.648                         | 31.600                 | 159                                | 262.032         | <=400      | Pass    |
|           |         |                 | DH5         | 2.896                         | 31.600                 | 125                                | 362.000         | <=400      | Pass    |
| Pi/4DQPSK | SISO    | HOPP            | 2DH1        | 0.390                         | 31.600                 | 315                                | 122.850         | <=400      | Pass    |
|           |         |                 | 2DH3        | 1.644                         | 31.600                 | 173                                | 284.412         | <=400      | Pass    |
|           |         |                 | 2DH5        | 2.892                         | 31.600                 | 113                                | 326.796         | <=400      | Pass    |
| 8DPSK     | SISO    | HOPP            | 3DH1        | 0.392                         | 31.600                 | 314                                | 123.088         | <=400      | Pass    |
|           |         |                 | 3DH3        | 1.640                         | 31.600                 | 169                                | 277.160         | <=400      | Pass    |
|           |         |                 | 3DH5        | 2.892                         | 31.600                 | 120                                | 347.040         | <=400      | Pass    |

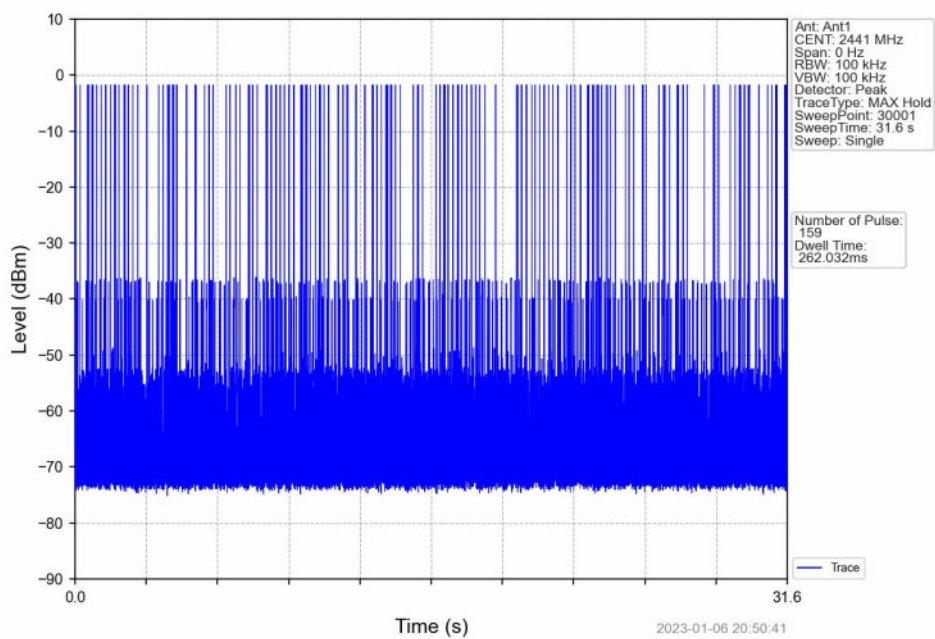
## 5.1.2 Test Graph



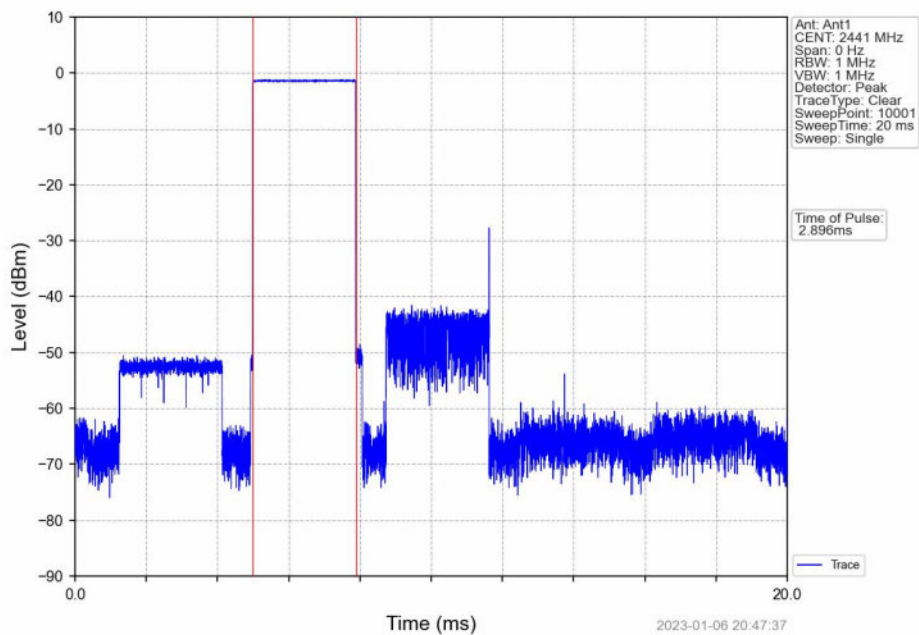
GFSK\_DH3\_HOPP\_Ant1\_NTNV



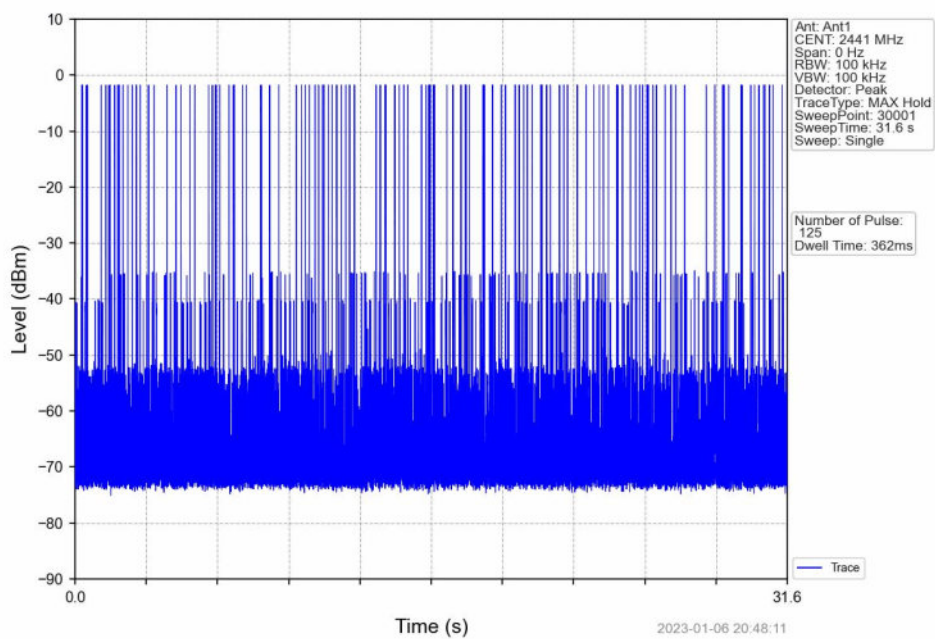
GFSK\_DH3\_HOPP\_Ant1\_NTNV



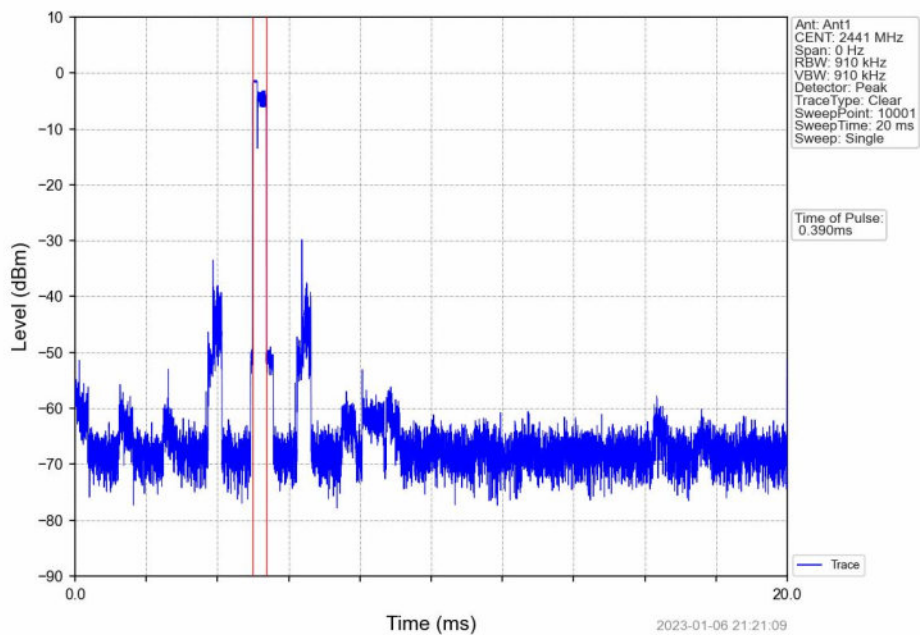
GFSK\_DH5\_HOPP\_Ant1\_NTNV



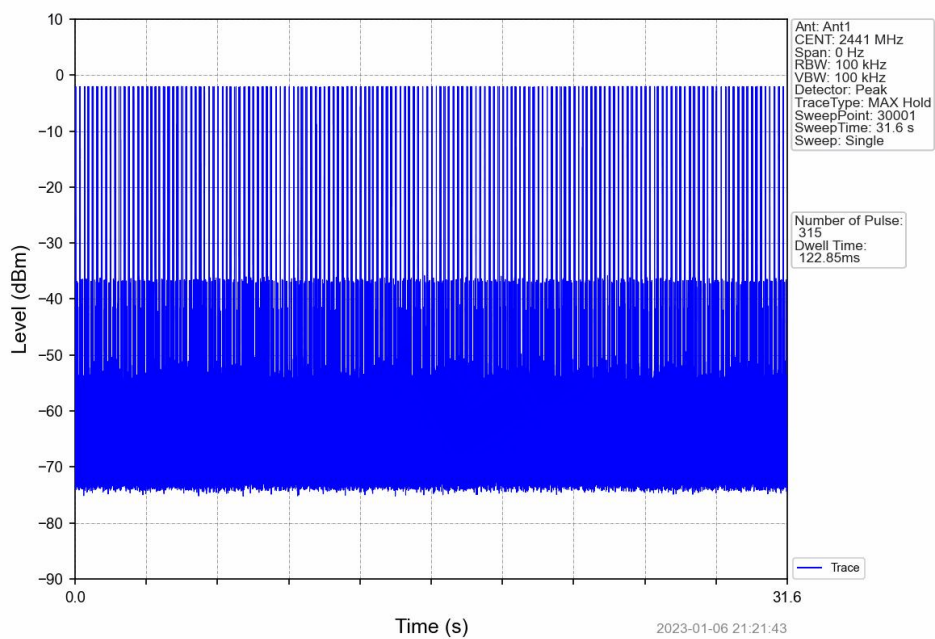
GFSK\_DH5\_HOPP\_Ant1\_NTNV



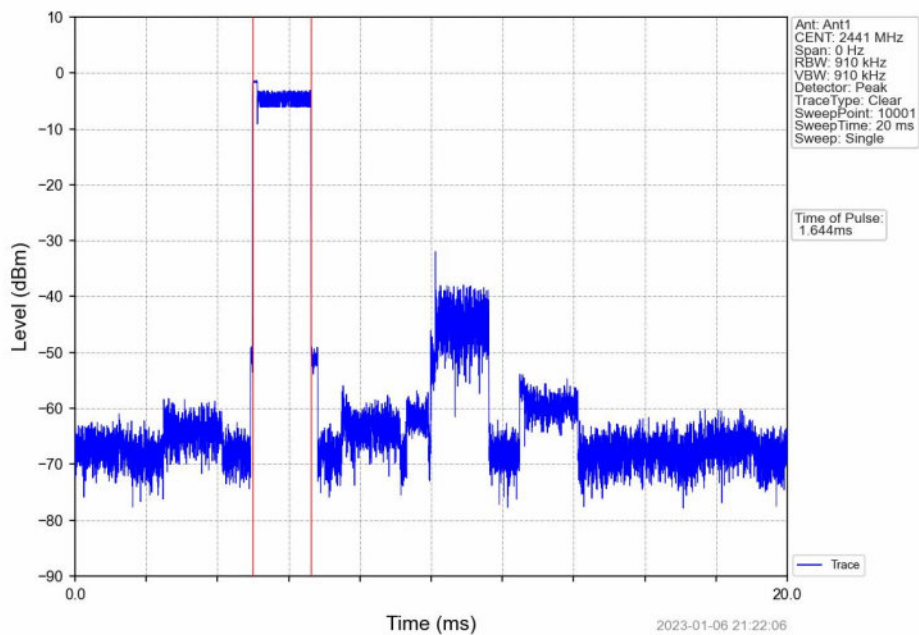
Pi/4DQPSK\_2DH1\_HOPP\_Ant1\_NTNV



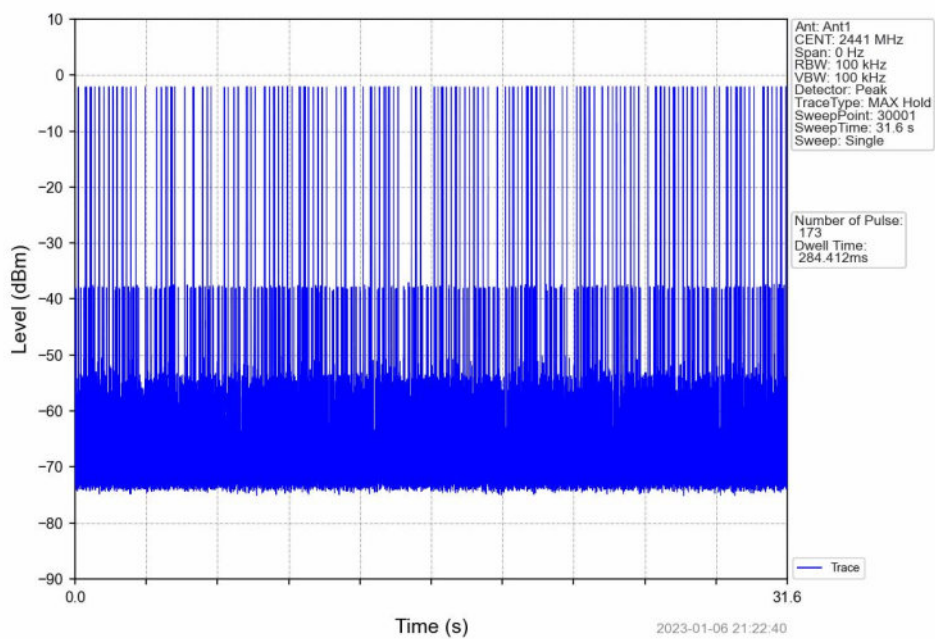
Pi/4DQPSK\_2DH1\_HOPP\_Ant1\_NTNV



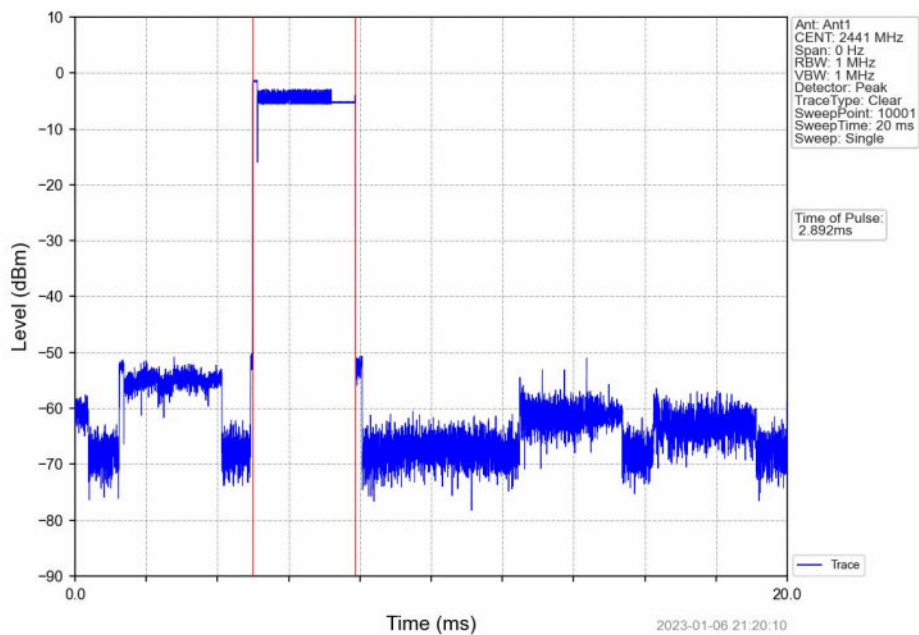
Pi/4DQPSK\_2DH3\_HOPP\_Ant1\_NTNV



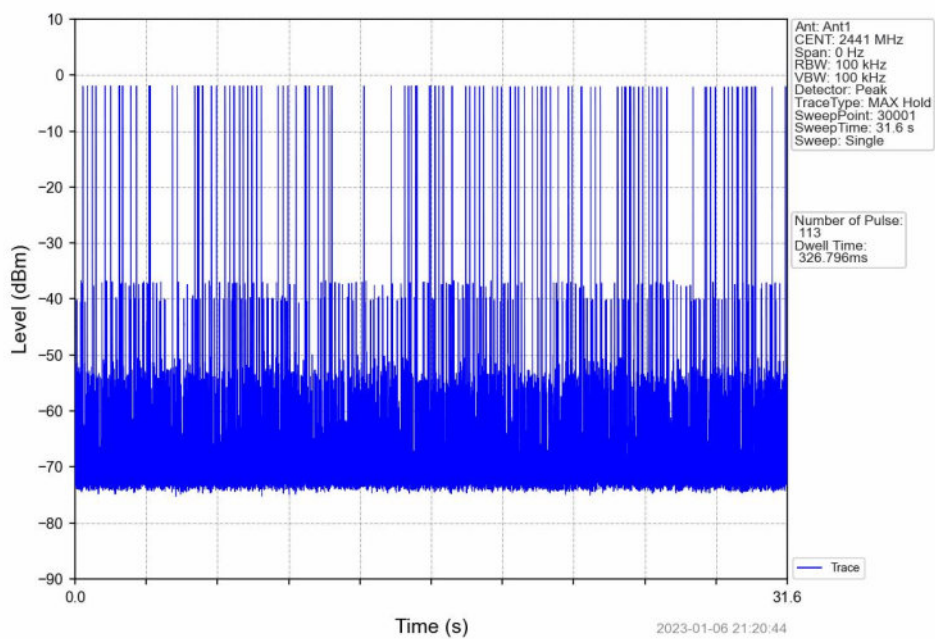
Pi/4DQPSK\_2DH3\_HOPP\_Ant1\_NTNV



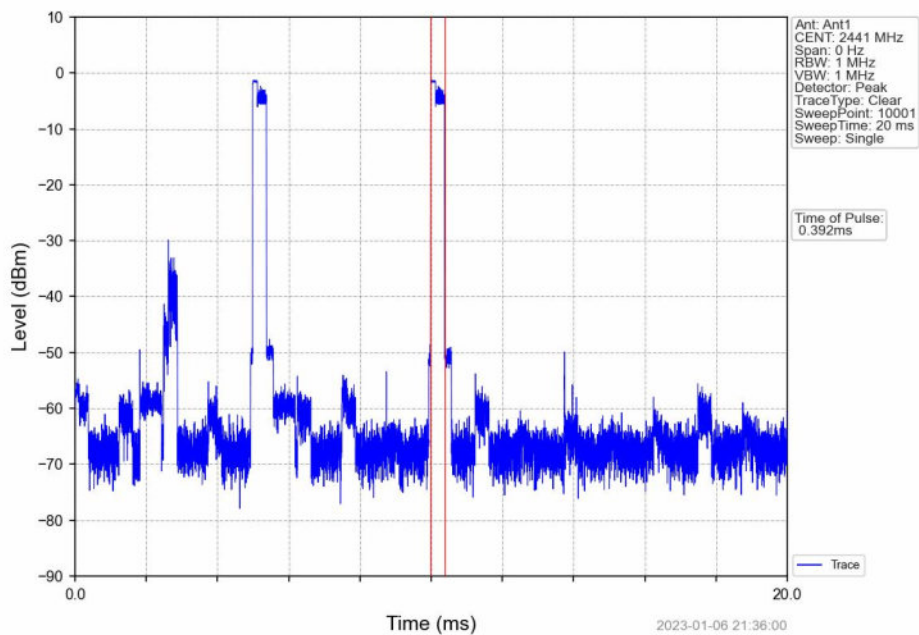
Pi/4DQPSK\_2DH5\_HOPP\_Ant1\_NTNV



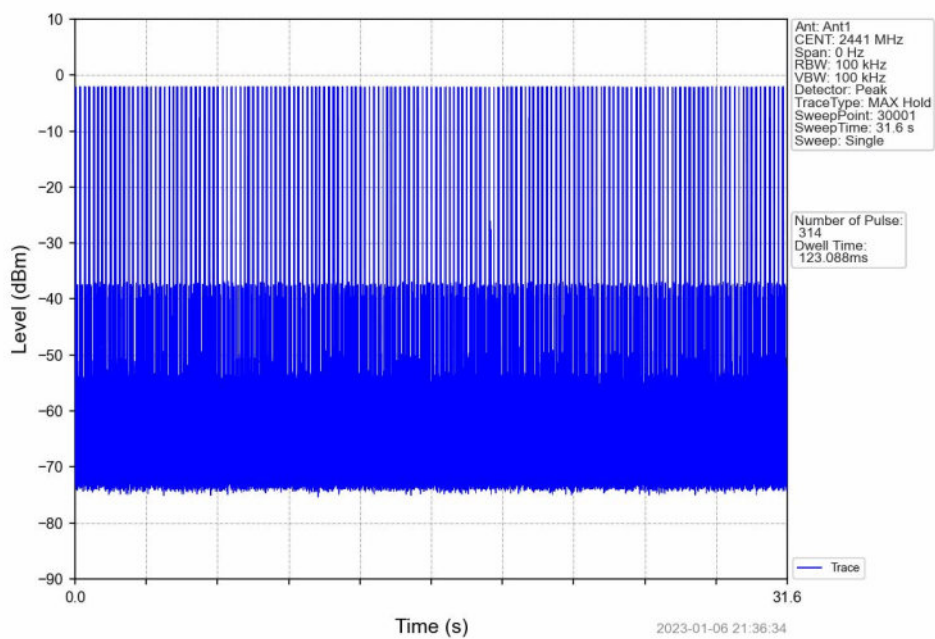
Pi/4DQPSK\_2DH5\_HOPP\_Ant1\_NTNV



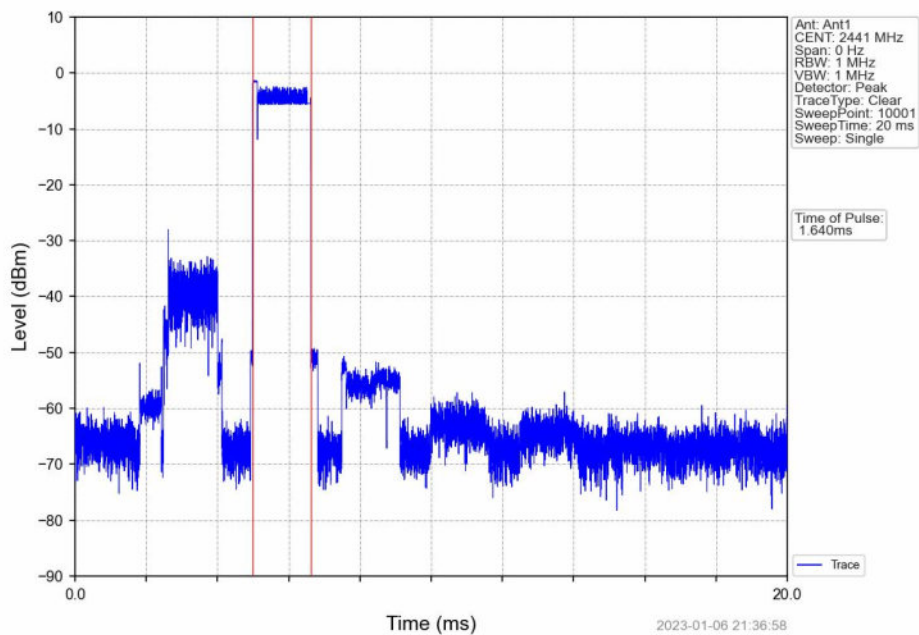
8DPSK\_3DH1\_HOPP\_Ant1\_NTNV



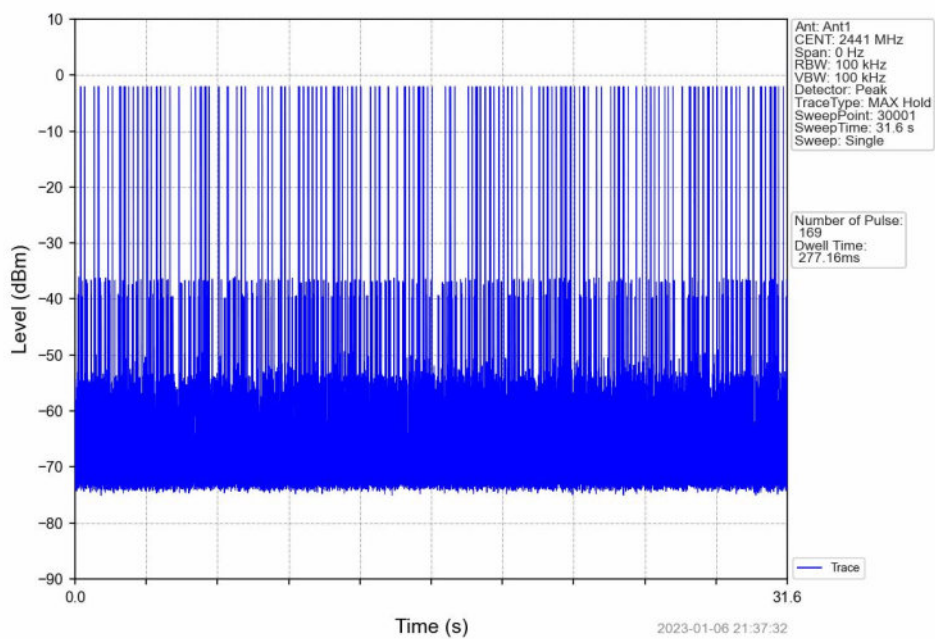
8DPSK\_3DH1\_HOPP\_Ant1\_NTNV



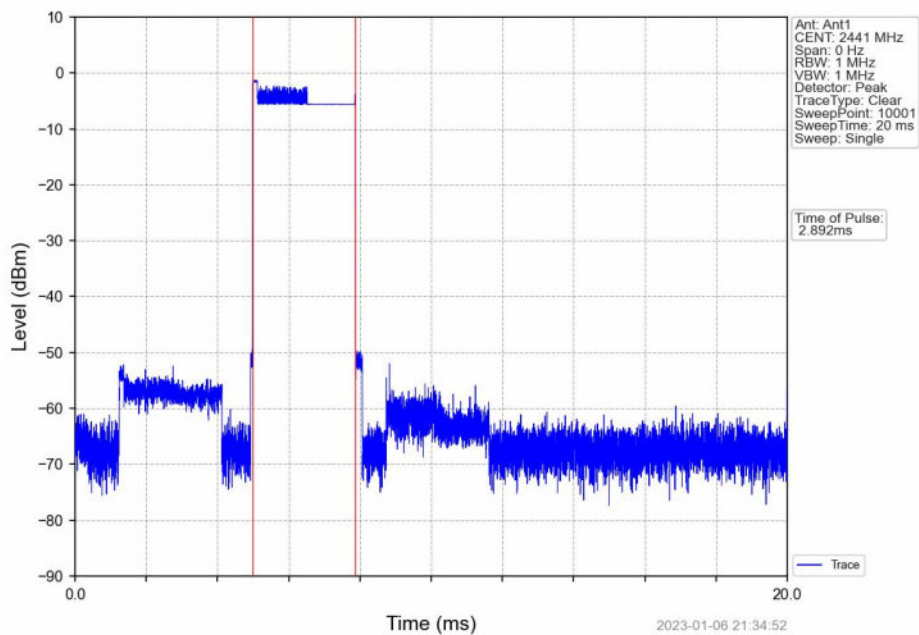
8DPSK\_3DH3\_HOPP\_Ant1\_NTNV



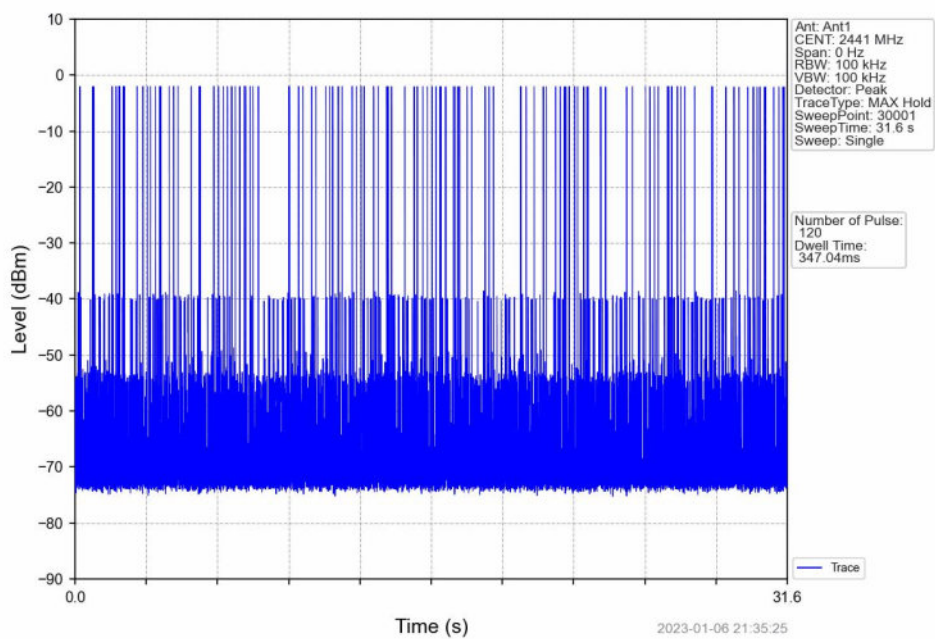
8DPSK\_3DH3\_HOPP\_Ant1\_NTNV



8DPSK\_3DH5\_HOPP\_Ant1\_NTNV



8DPSK\_3DH5\_HOPP\_Ant1\_NTNV



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

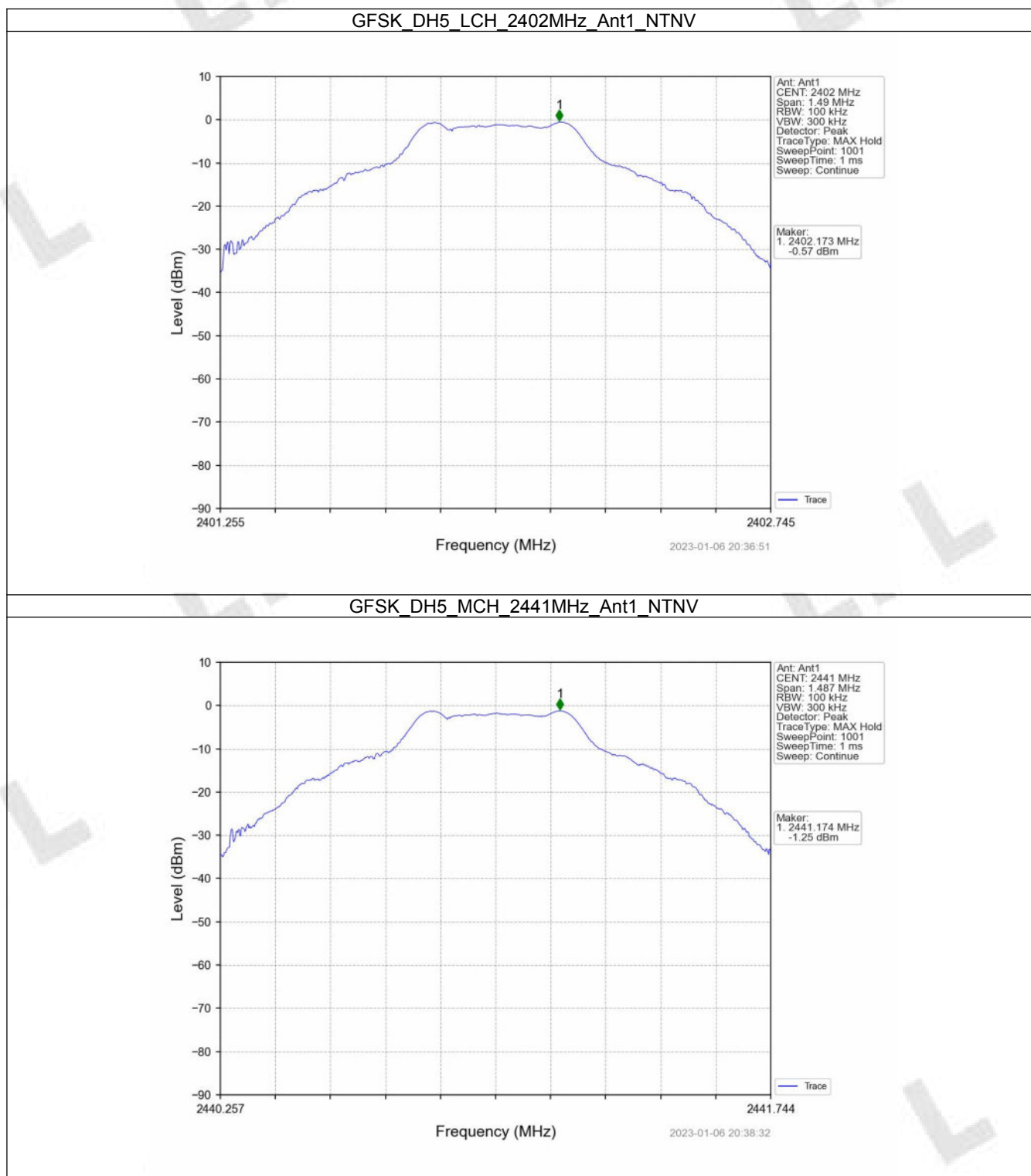
### 6.1 Ref

#### 6.1.1 Test Result

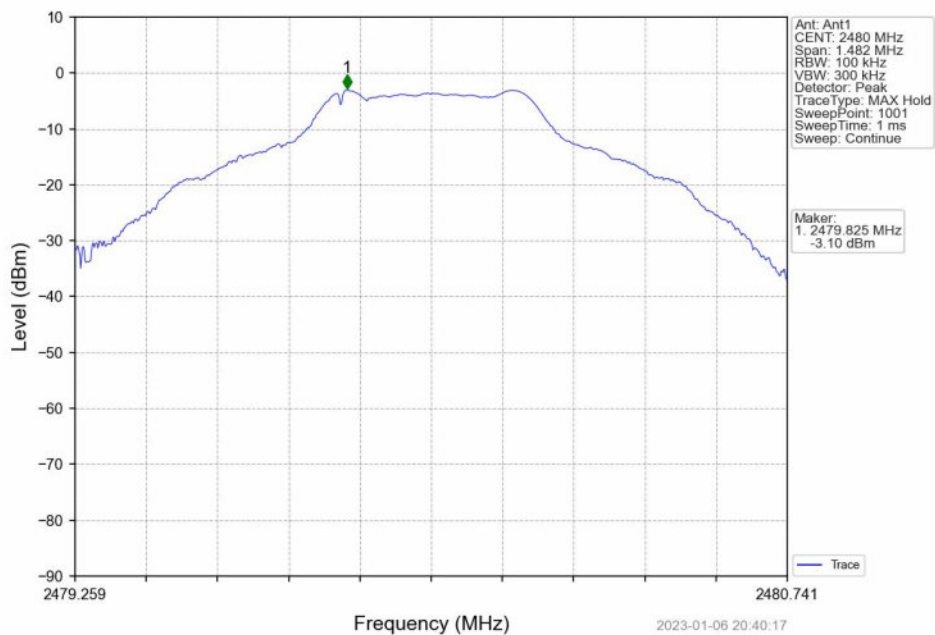
| Mode      | TX Type | Frequency (MHz) | Packet Type | ANT | Level of Reference (dBm) |
|-----------|---------|-----------------|-------------|-----|--------------------------|
| GFSK      | SISO    | 2402            | DH5         | 1   | -0.57                    |
|           |         | 2441            | DH5         | 1   | -1.25                    |
|           |         | 2480            | DH5         | 1   | -3.10                    |
| Pi/4DQPSK | SISO    | 2402            | 2DH5        | 1   | -0.64                    |
|           |         | 2441            | 2DH5        | 1   | -1.27                    |
|           |         | 2480            | 2DH5        | 1   | -3.15                    |
| 8DPSK     | SISO    | 2402            | 3DH5        | 1   | -0.61                    |
|           |         | 2441            | 3DH5        | 1   | -1.27                    |
|           |         | 2480            | 3DH5        | 1   | -3.07                    |

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.

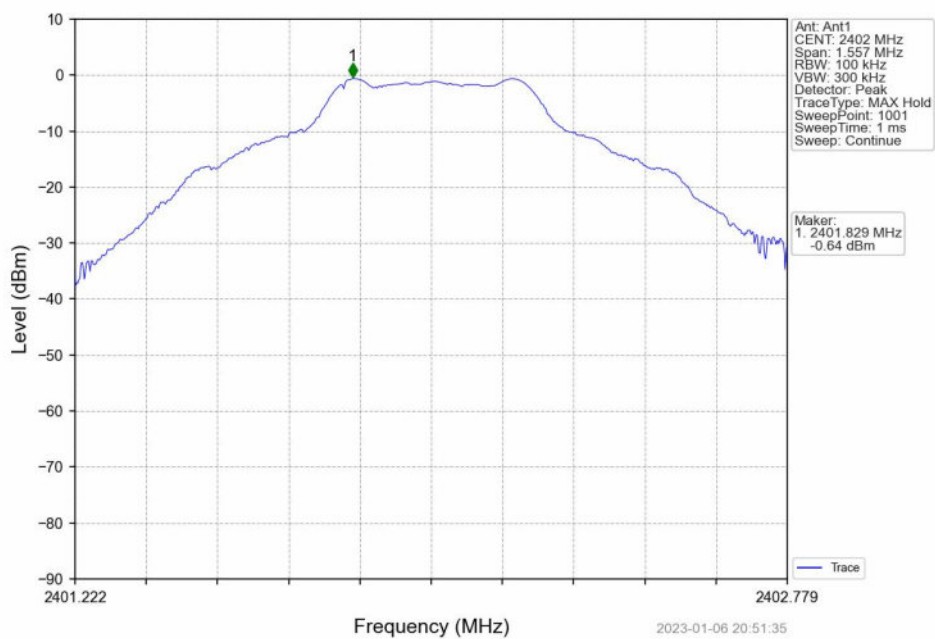
## 6.1.2 Test Graph



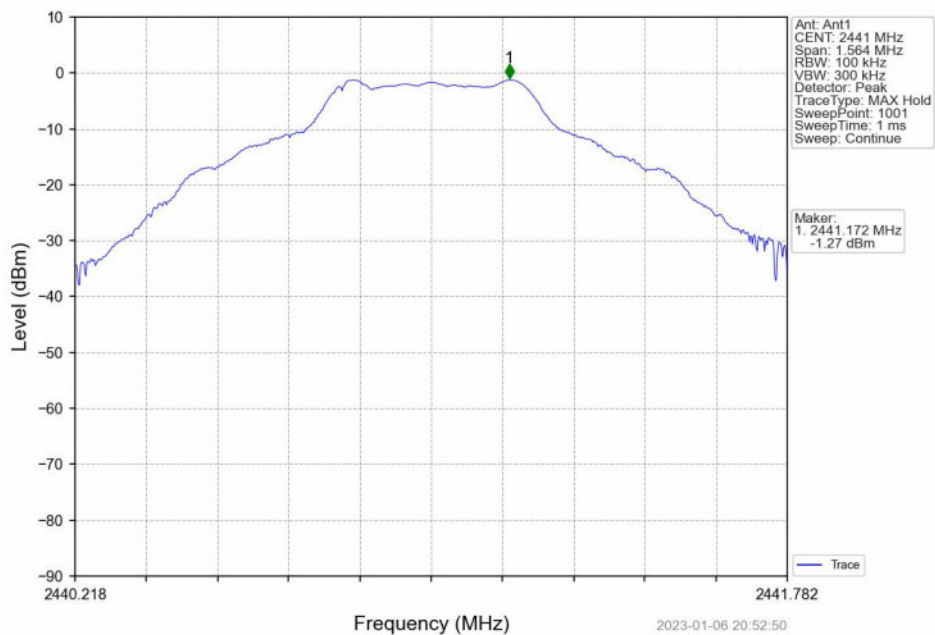
GFSK DH5\_HCH\_2480MHz\_Ant1\_NTNV



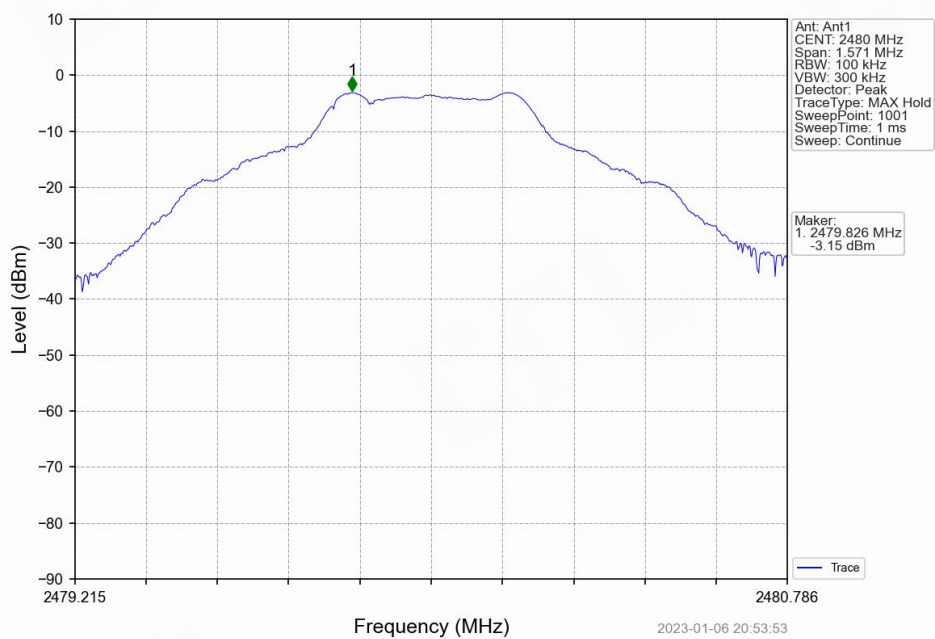
Pi/4DQPSK\_2DH5\_LCH\_2402MHz\_Ant1\_NTNV



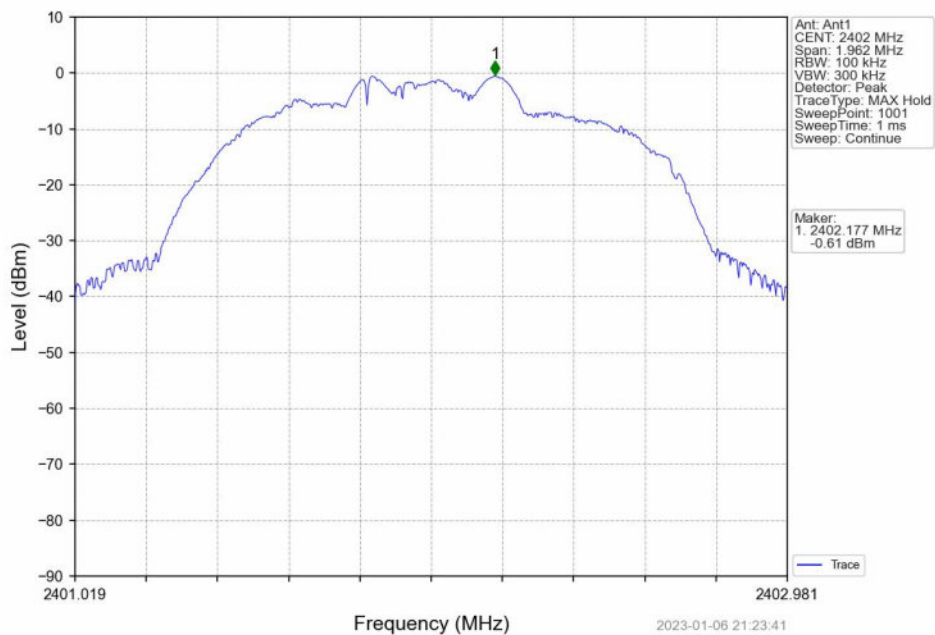
Pi/4DQPSK\_2DH5\_MCH\_2441MHz\_Ant1\_NTNV



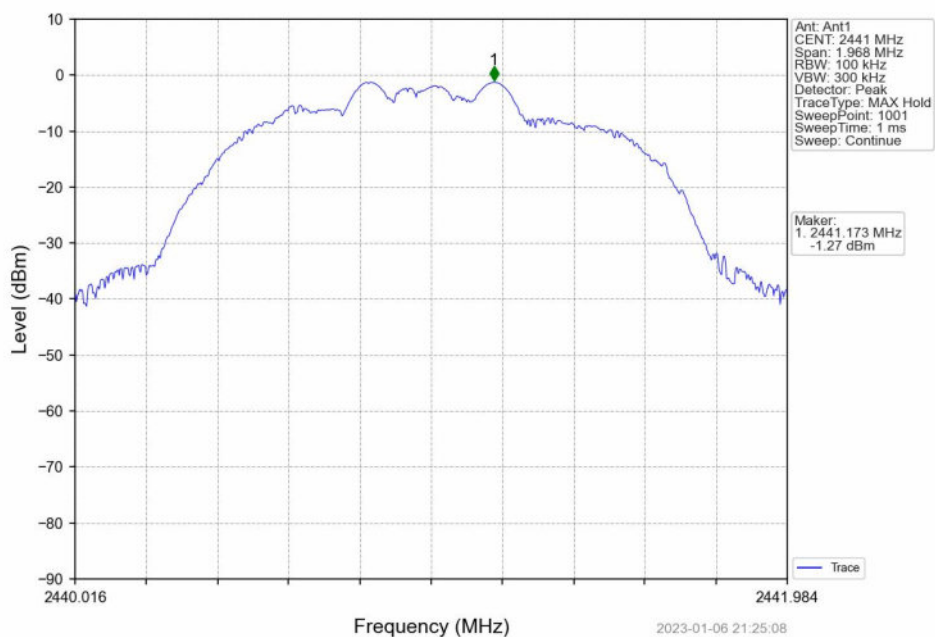
Pi/4DQPSK\_2DH5\_HCH\_2480MHz\_Ant1\_NTNV

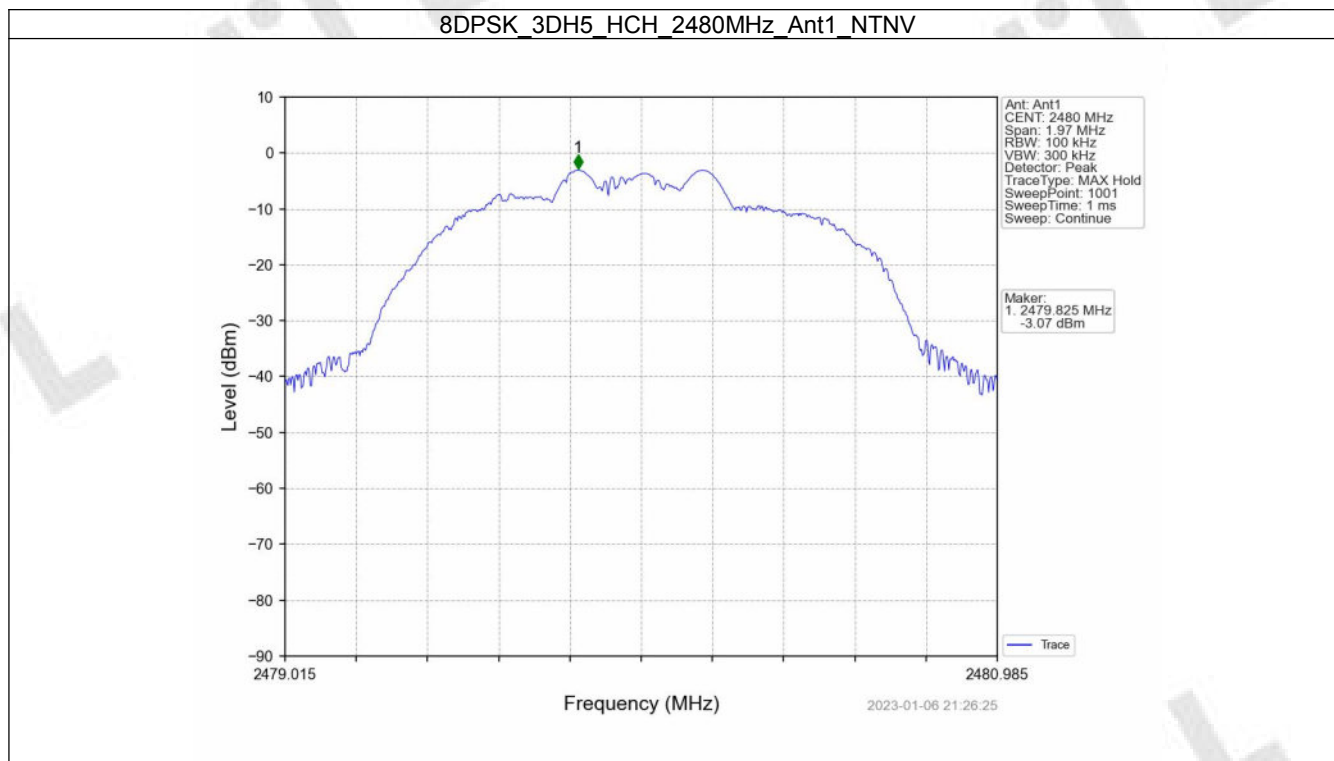


8DPSK\_3DH5\_LCH\_2402MHz\_Ant1\_NTNV



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





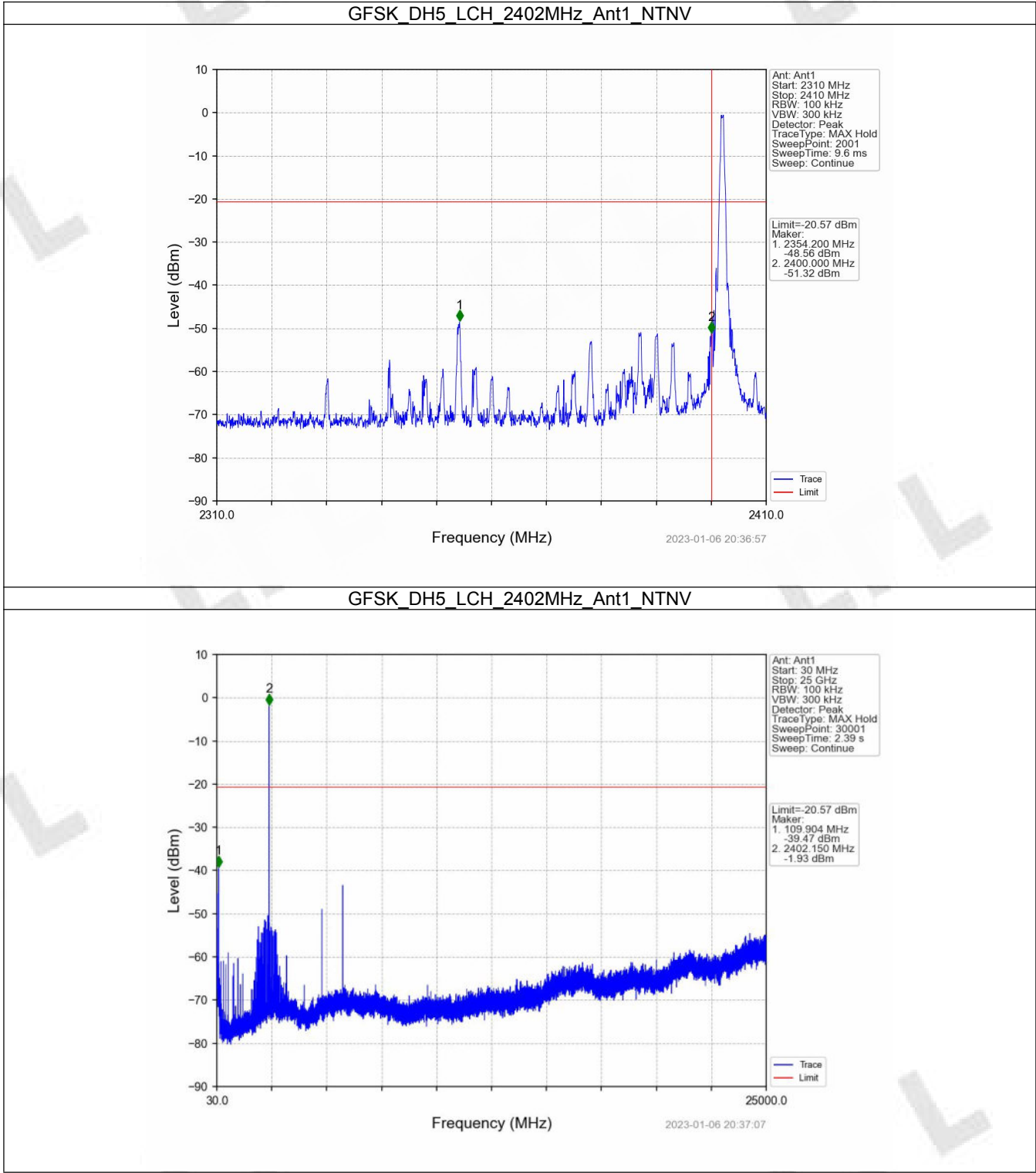
## 6.2 CSE

## 6.2.1 Test Result

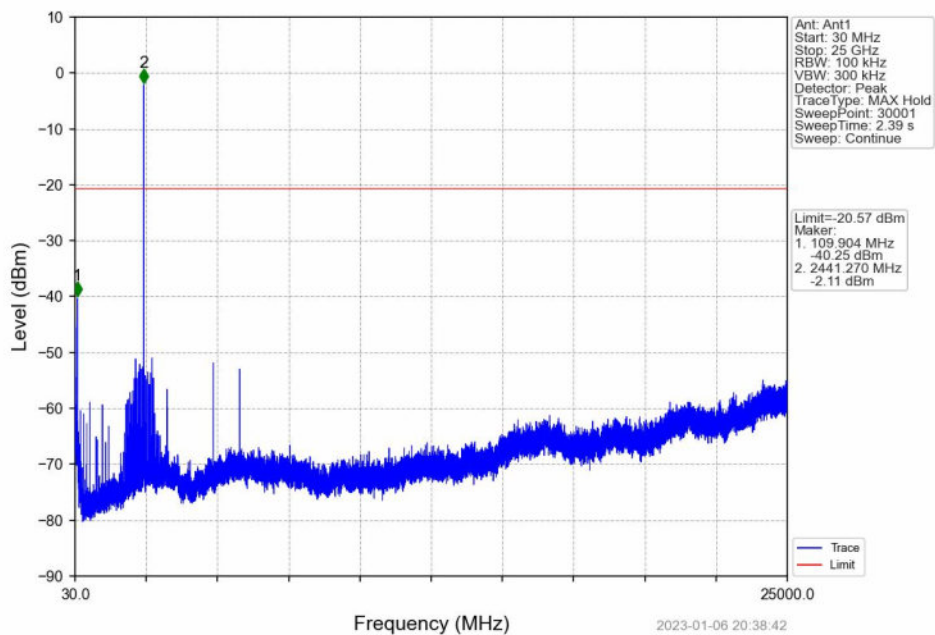
| Mode      | TX Type | Frequency (MHz) | Packet Type | ANT | Level of Reference (dBm) | Limit (dBm) | Verdict |
|-----------|---------|-----------------|-------------|-----|--------------------------|-------------|---------|
| GFSK      | SISO    | 2402            | DH5         | 1   | -0.57                    | -20.57      | Pass    |
|           |         | 2441            | DH5         | 1   | -0.57                    | -20.57      | Pass    |
|           |         | 2480            | DH5         | 1   | -0.57                    | -20.57      | Pass    |
|           |         | HOPP            | DH5         | 1   | -0.57                    | -20.57      | Pass    |
| Pi/4DQPSK | SISO    | 2402            | 2DH5        | 1   | -0.64                    | -20.64      | Pass    |
|           |         | 2441            | 2DH5        | 1   | -0.64                    | -20.64      | Pass    |
|           |         | 2480            | 2DH5        | 1   | -0.64                    | -20.64      | Pass    |
|           |         | HOPP            | 2DH5        | 1   | -0.64                    | -20.64      | Pass    |
| 8DPSK     | SISO    | 2402            | 3DH5        | 1   | -0.61                    | -20.61      | Pass    |
|           |         | 2441            | 3DH5        | 1   | -0.61                    | -20.61      | Pass    |
|           |         | 2480            | 3DH5        | 1   | -0.61                    | -20.61      | Pass    |
|           |         | HOPP            | 3DH5        | 1   | -0.61                    | -20.61      | 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.

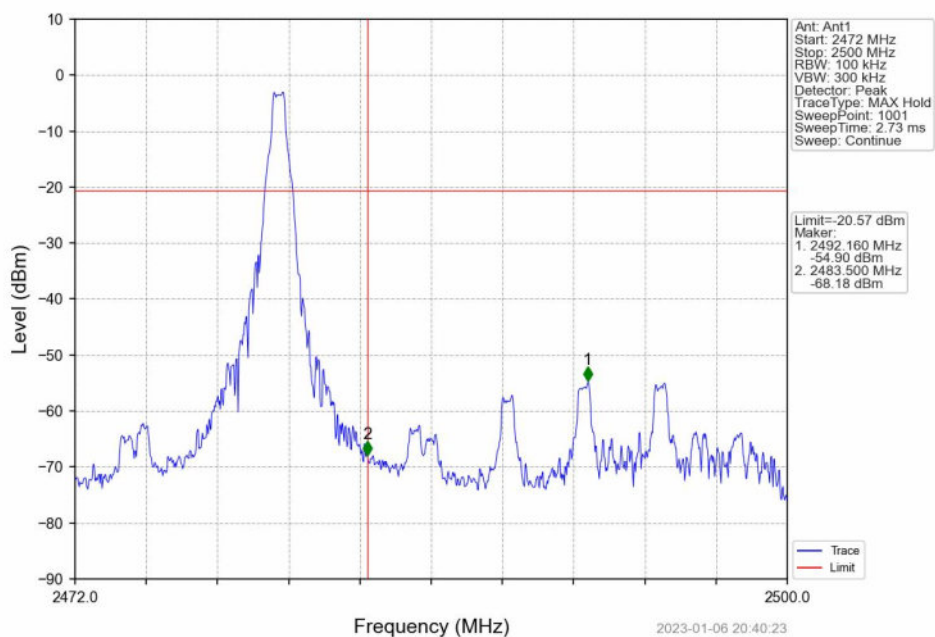
6.2.2 Test Graph



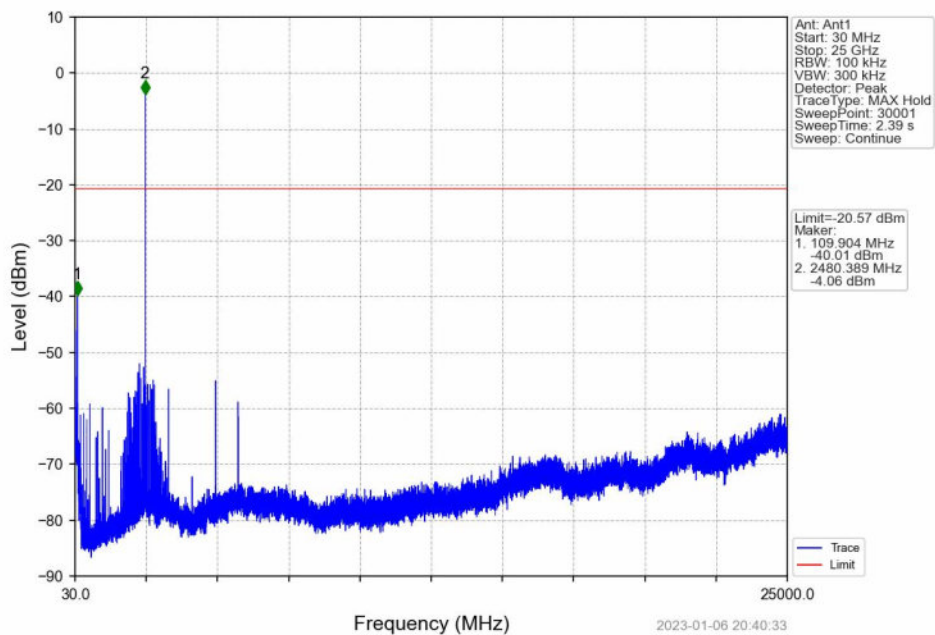
GFSK\_DH5\_MCH\_2441MHz\_Ant1\_NTNV



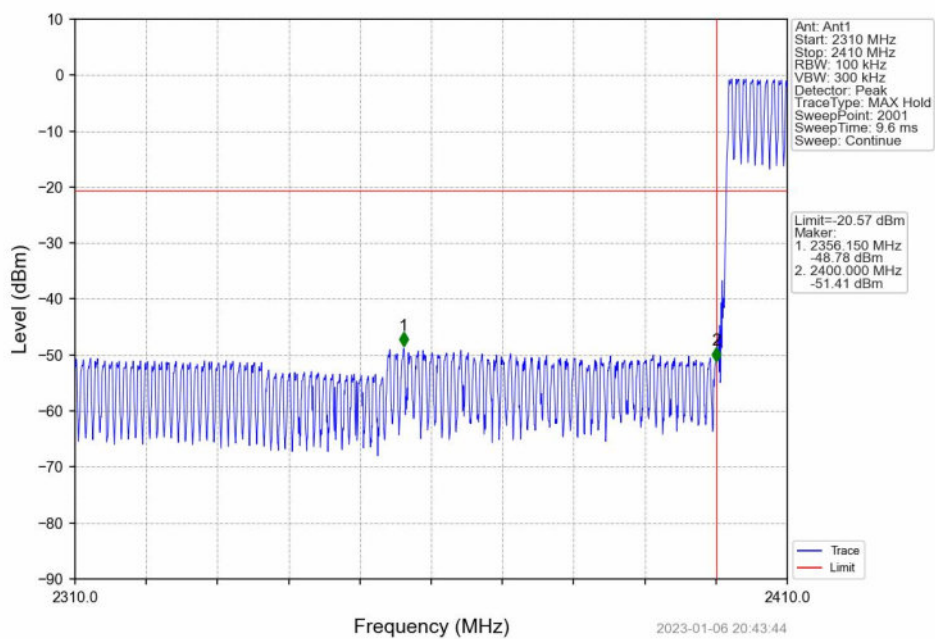
GFSK\_DH5\_HCH\_2480MHz\_Ant1\_NTNV



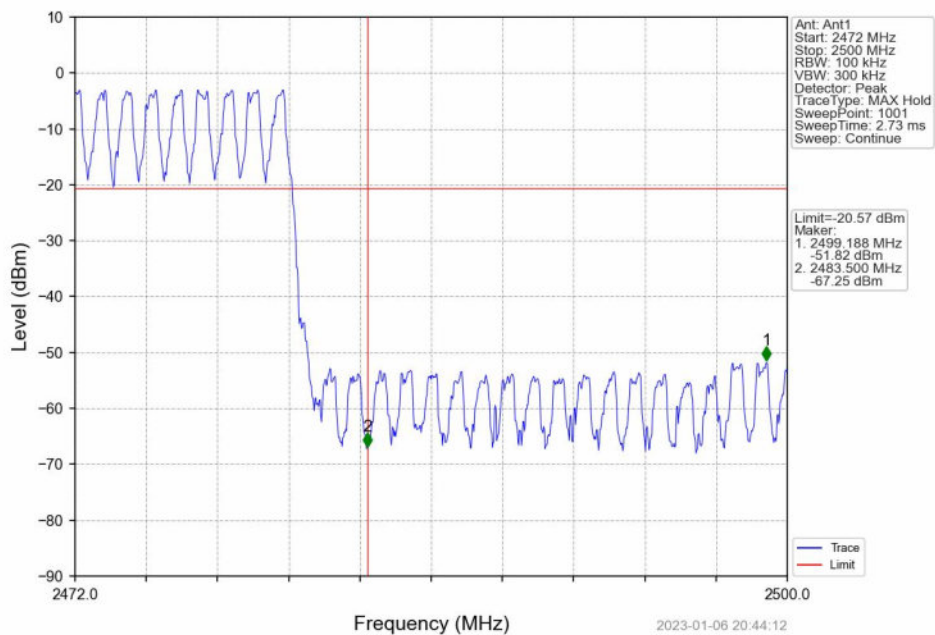
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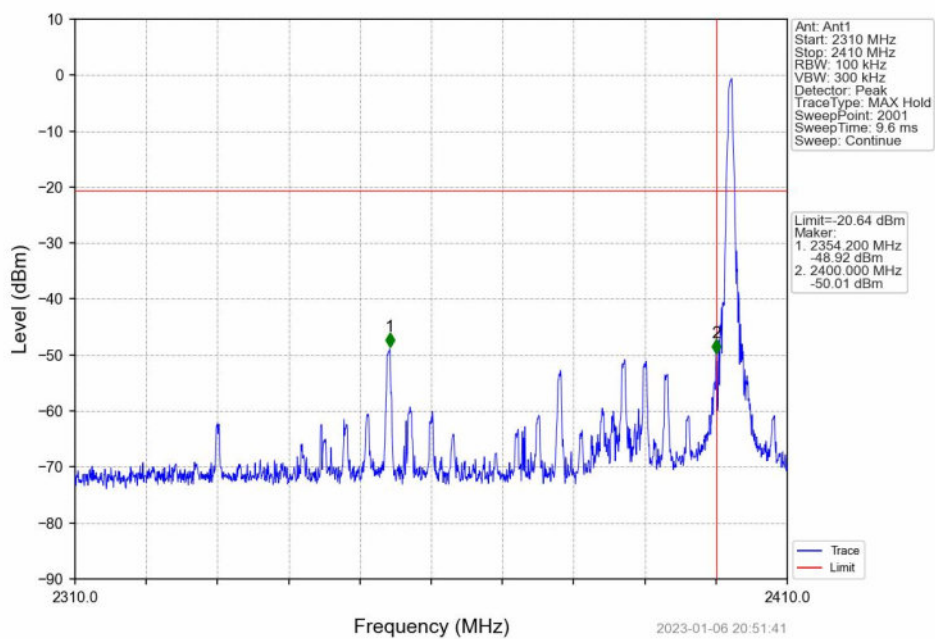
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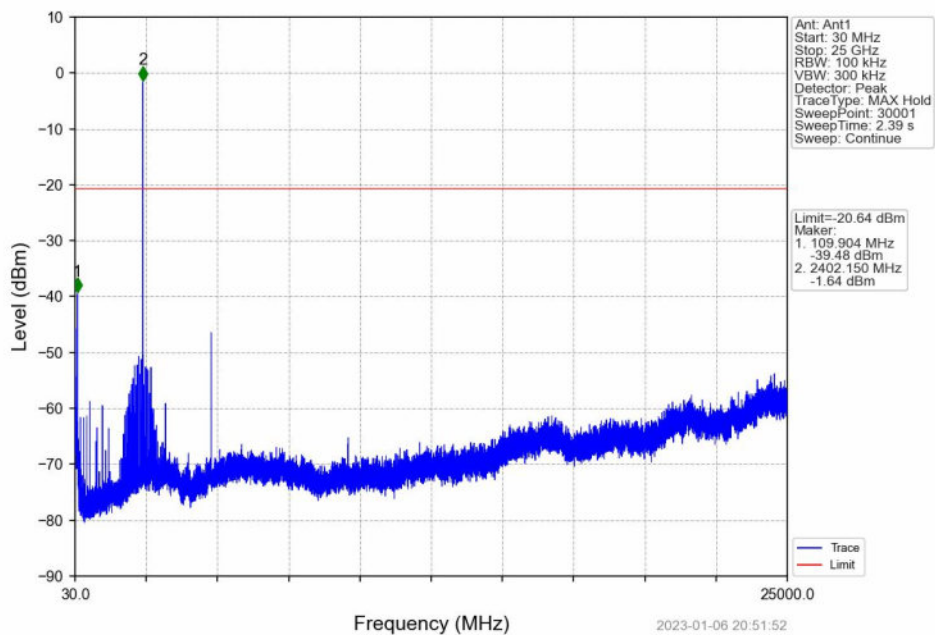
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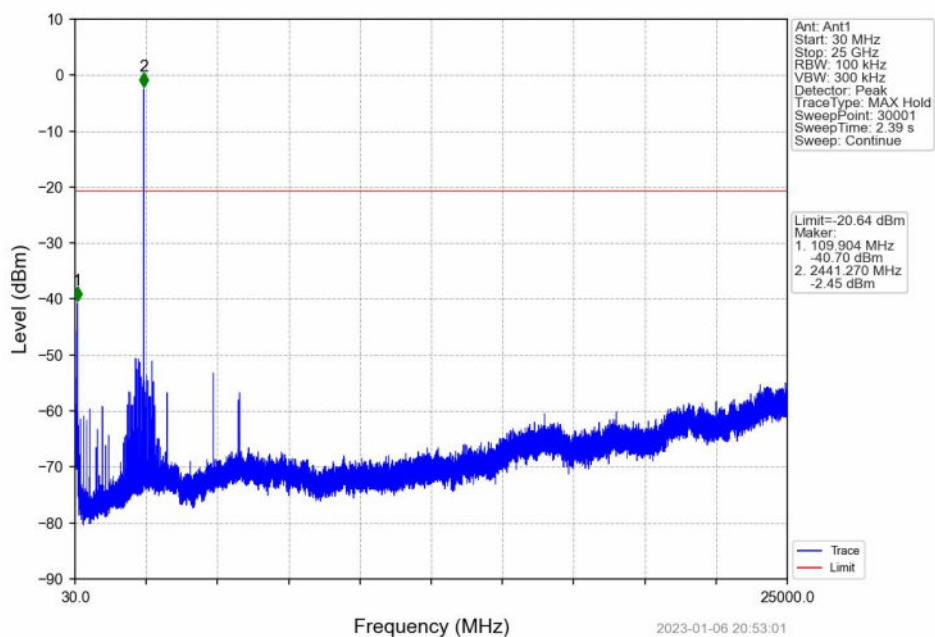
Pi/4DQPSK\_2DH5\_LCH\_2402MHz\_Ant1\_NTNV



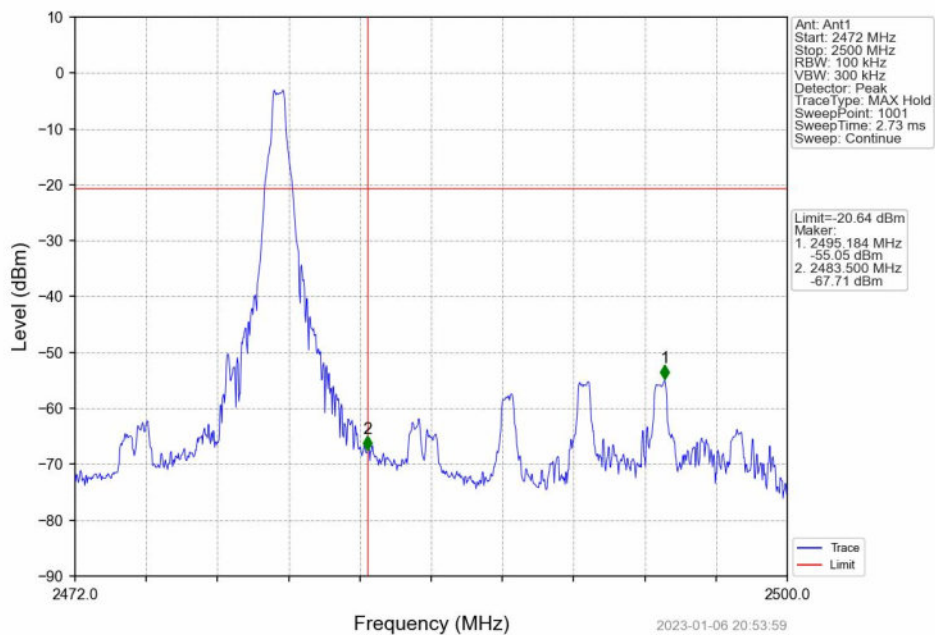
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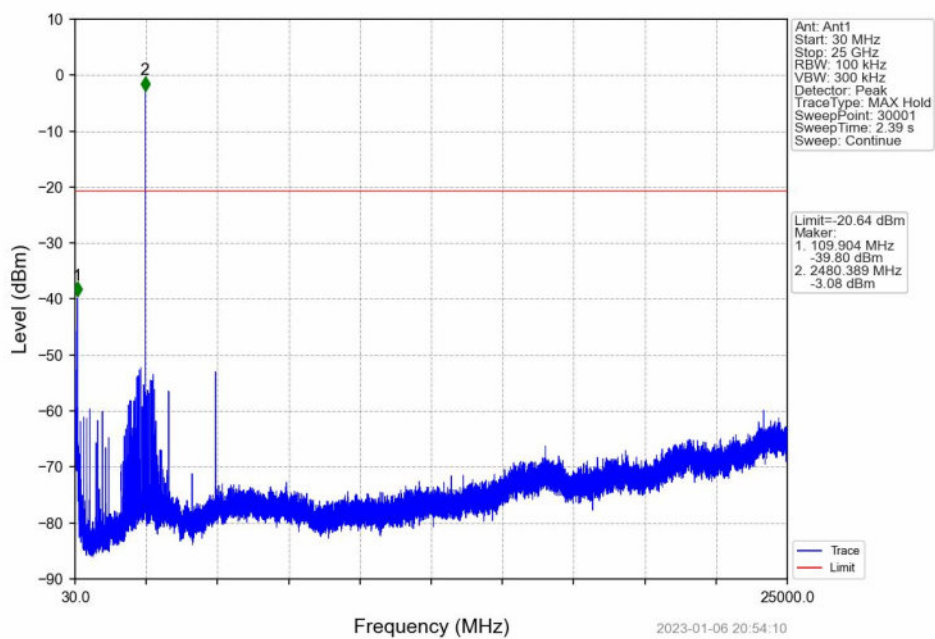
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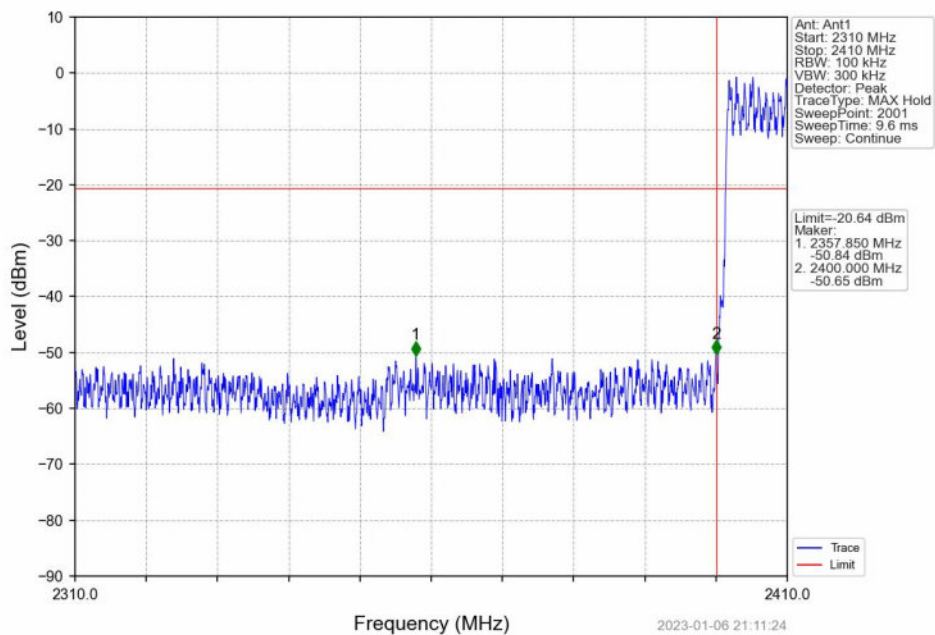
Pi/4DQPSK\_2DH5\_HCH\_2480MHz\_Ant1\_NTNV



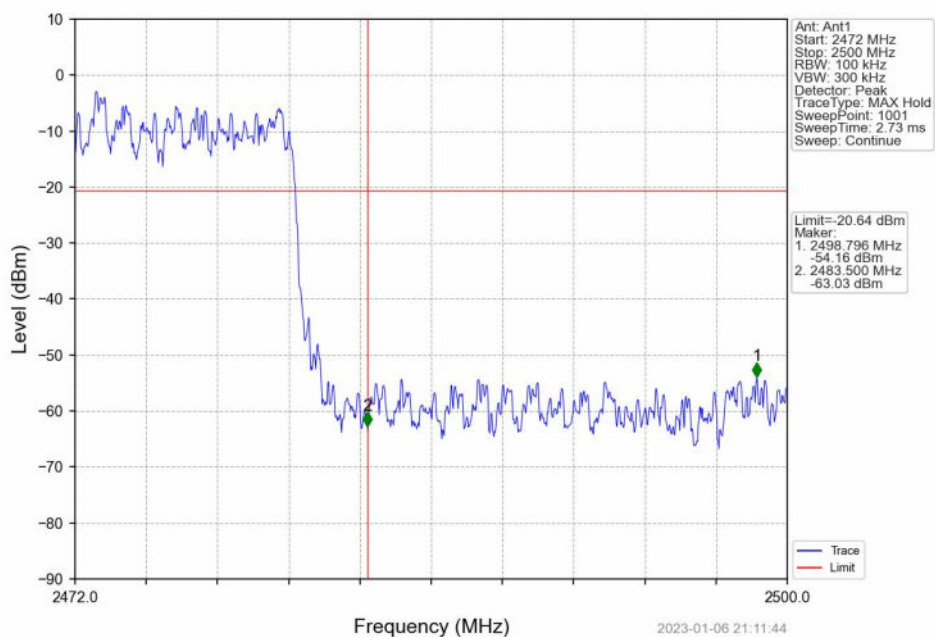
Pi/4DQPSK\_2DH5\_HCH\_2480MHz\_Ant1\_NTNV



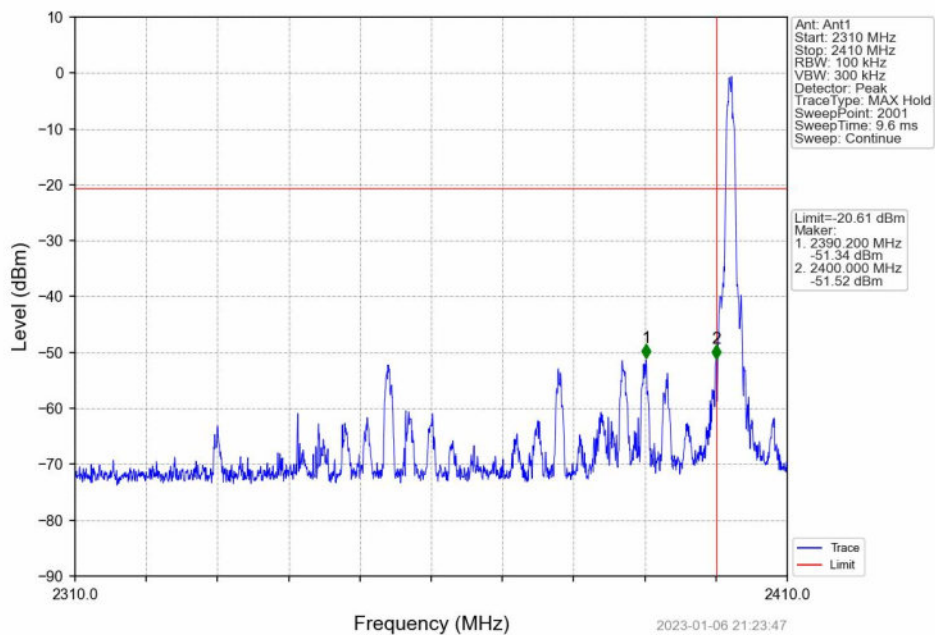
Pi/4DQPSK\_2DH5\_HOPP\_Ant1\_NTNV



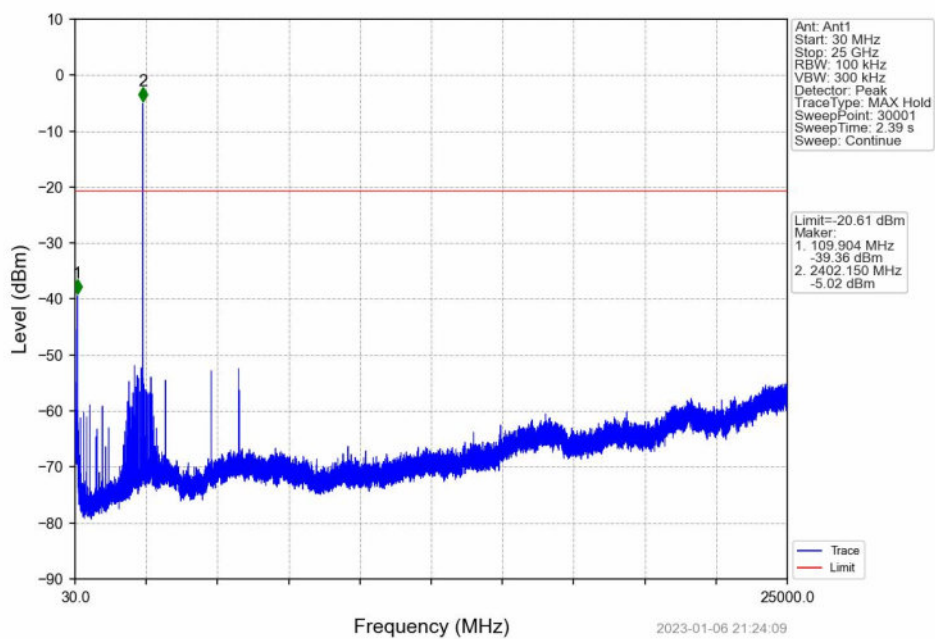
Pi/4DQPSK\_2DH5\_HOPP\_Ant1\_NTNV



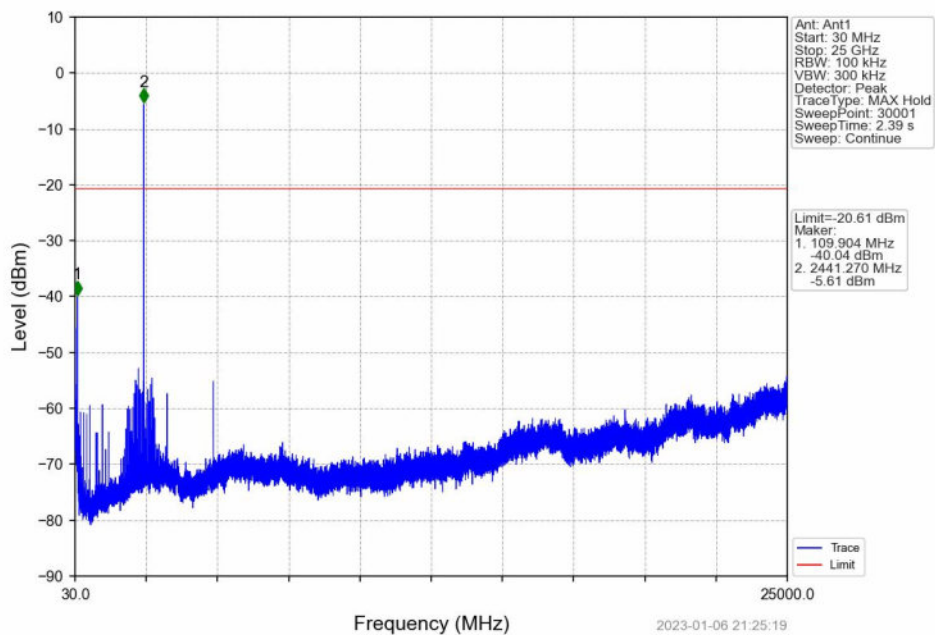
8DPSK\_3DH5\_LCH\_2402MHz\_Ant1\_NTNV



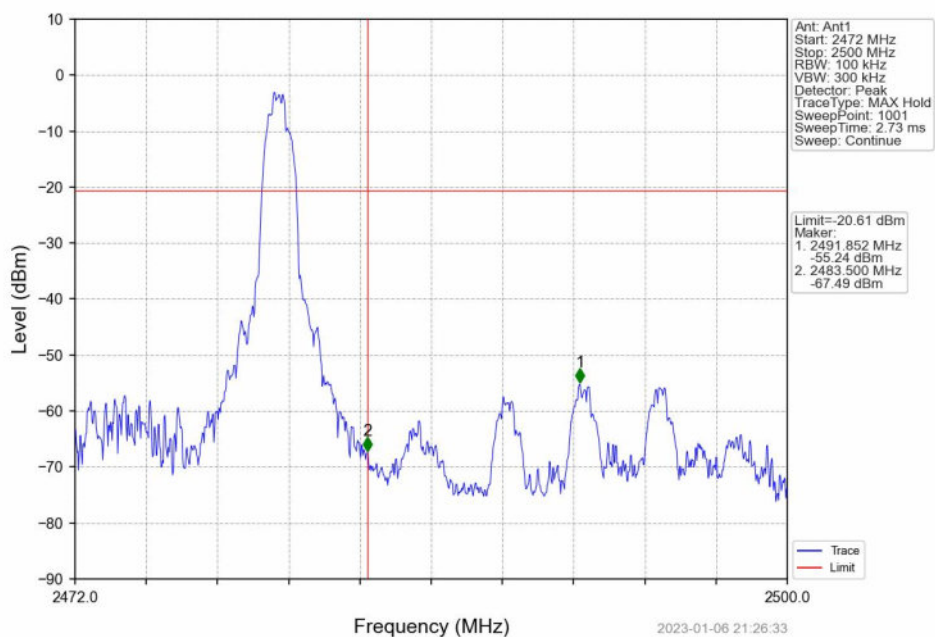
8DPSK\_3DH5\_LCH\_2402MHz\_Ant1\_NTNV



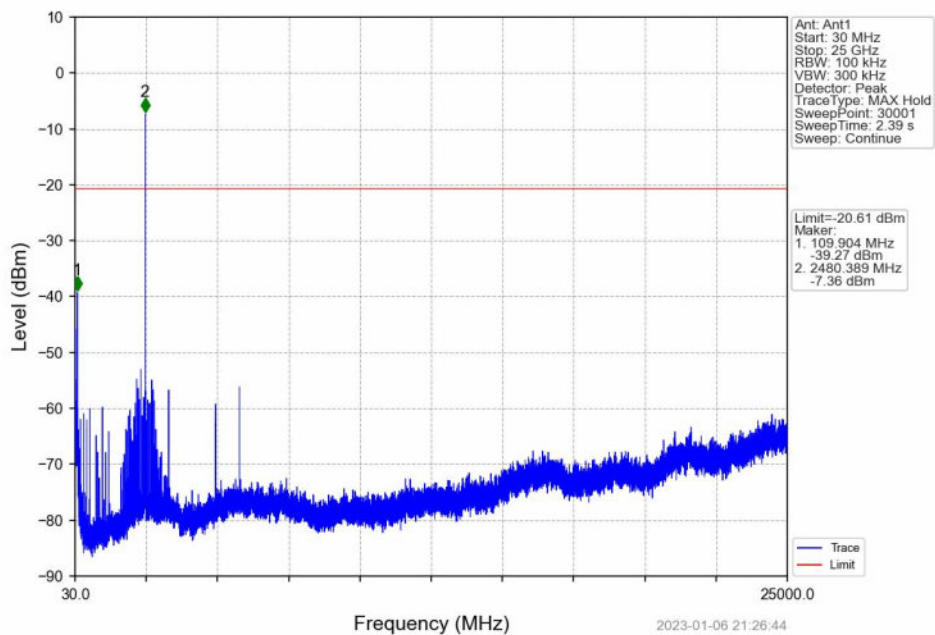
8DPSK\_3DH5\_MCH\_2441MHz\_Ant1\_NTNV



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



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



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

