



Shenzhen CTL Testing Technology Co., Ltd.

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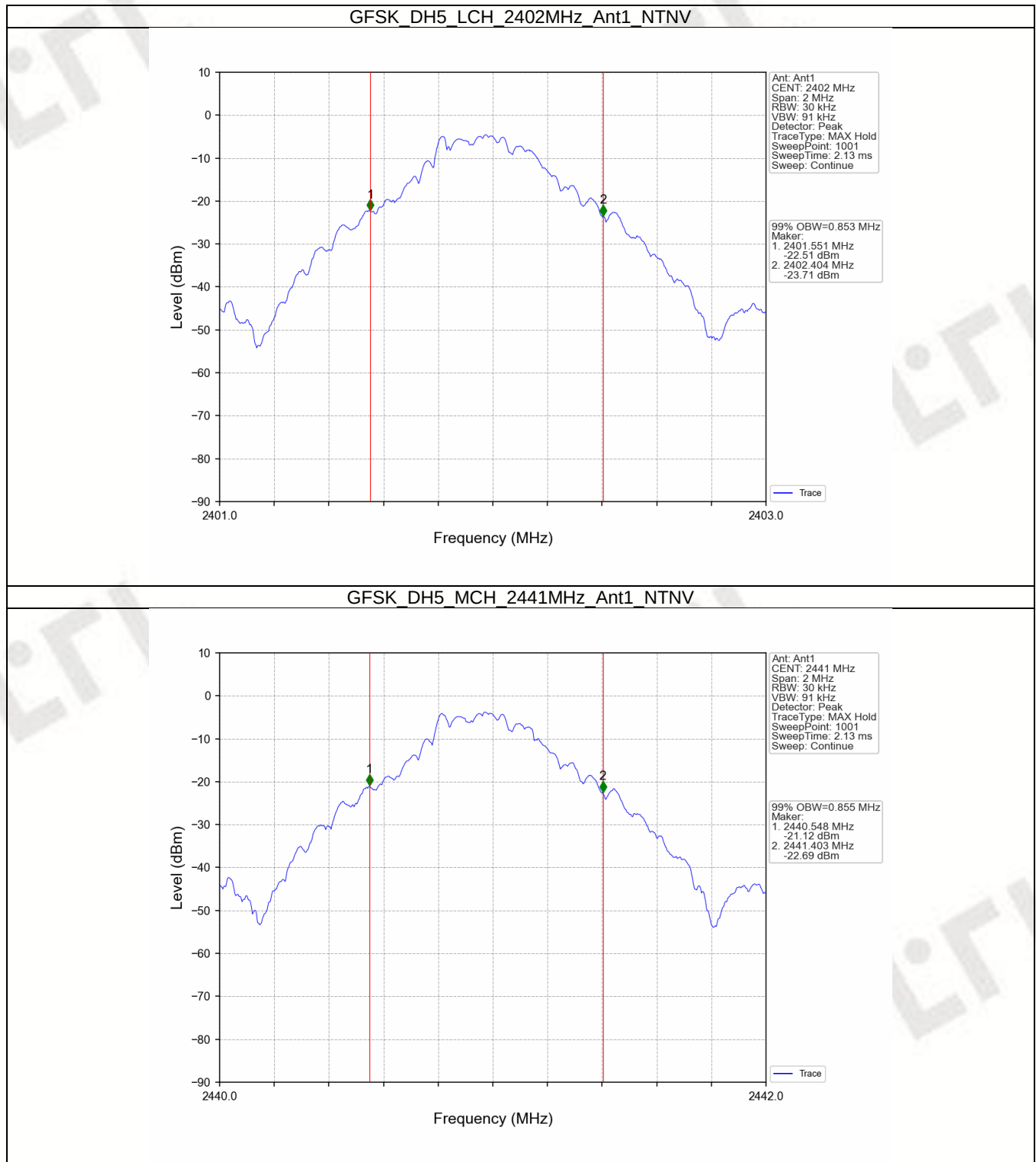
## 1. Bandwidth

### 1.1 OBW

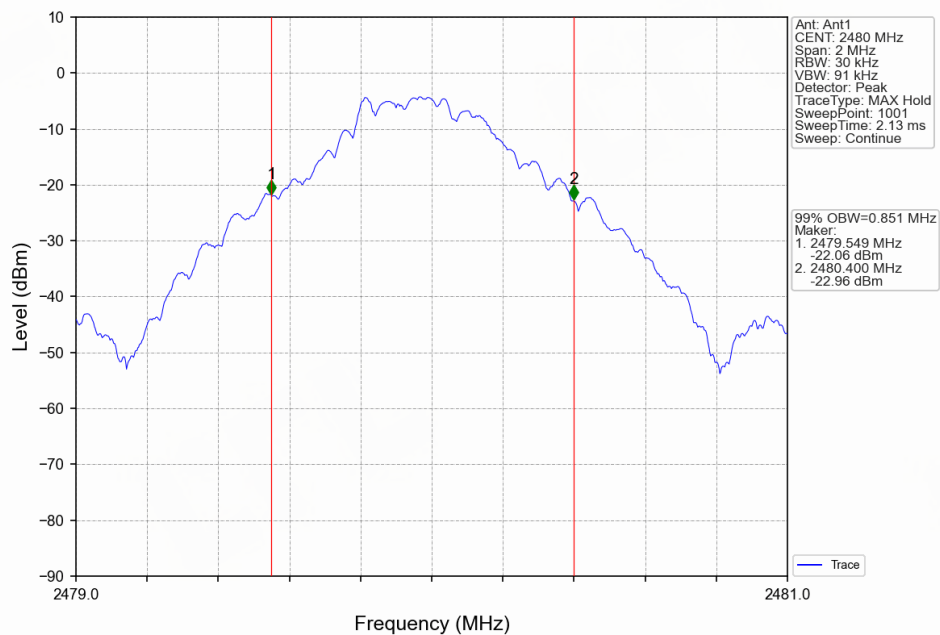
#### 1.1.1 Test Result

| Mode      | TX Type | Frequency (MHz) | Packet Type | ANT | 99% Occupied Bandwidth (MHz) | Verdict |
|-----------|---------|-----------------|-------------|-----|------------------------------|---------|
|           |         |                 |             |     | Result                       |         |
| GFSK      | SISO    | 2402            | DH5         | 1   | 0.853                        | Pass    |
|           |         | 2441            | DH5         | 1   | 0.855                        | Pass    |
|           |         | 2480            | DH5         | 1   | 0.851                        | Pass    |
| Pi/4DQPSK | SISO    | 2402            | 2DH5        | 1   | 1.170                        | Pass    |
|           |         | 2441            | 2DH5        | 1   | 1.165                        | Pass    |
|           |         | 2480            | 2DH5        | 1   | 1.166                        | Pass    |
| 8DPSK     | SISO    | 2402            | 3DH5        | 1   | 1.176                        | Pass    |
|           |         | 2441            | 3DH5        | 1   | 1.178                        | Pass    |
|           |         | 2480            | 3DH5        | 1   | 1.176                        | Pass    |

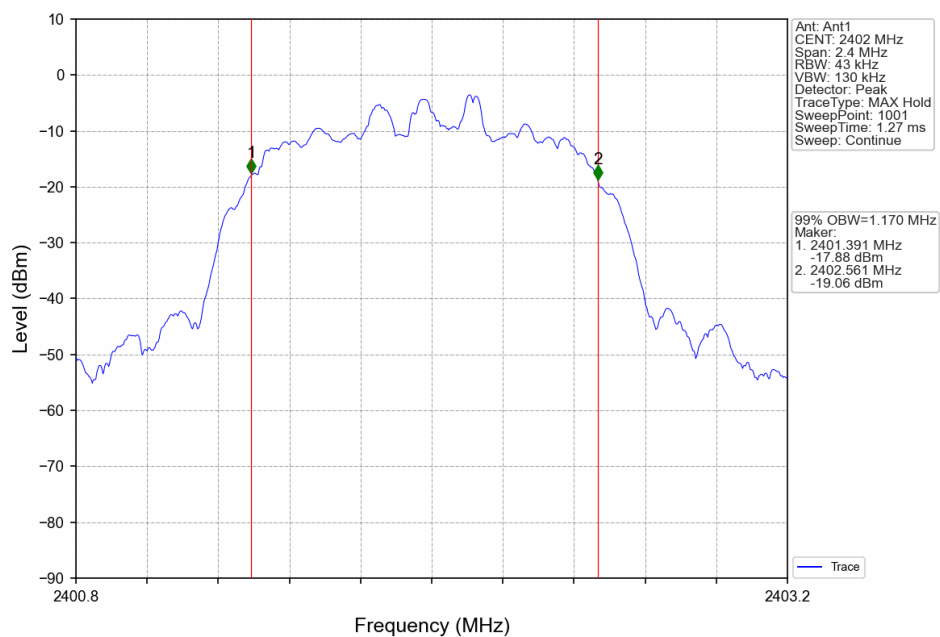
## 1.1.2 Test Graph



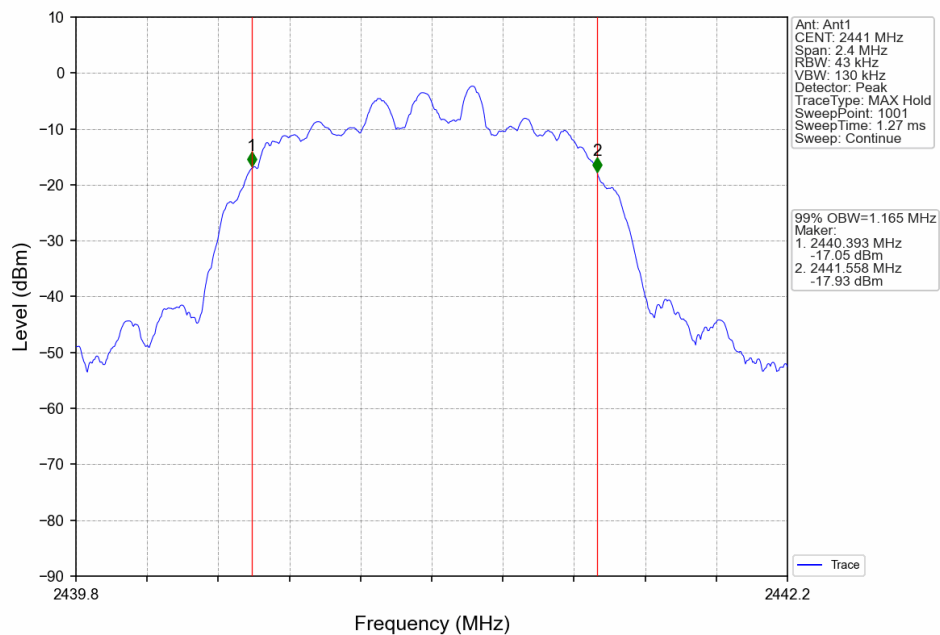
GFSK DH5 HCH 2480MHz Ant1 NTV



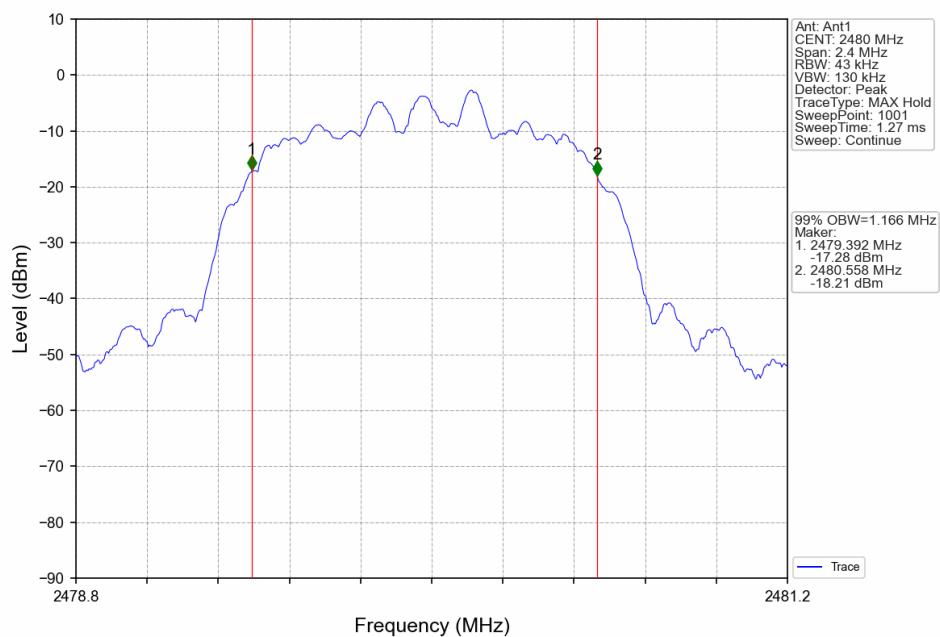
Pi/4DQPSK 2DH5 LCH 2402MHz Ant1 NTV



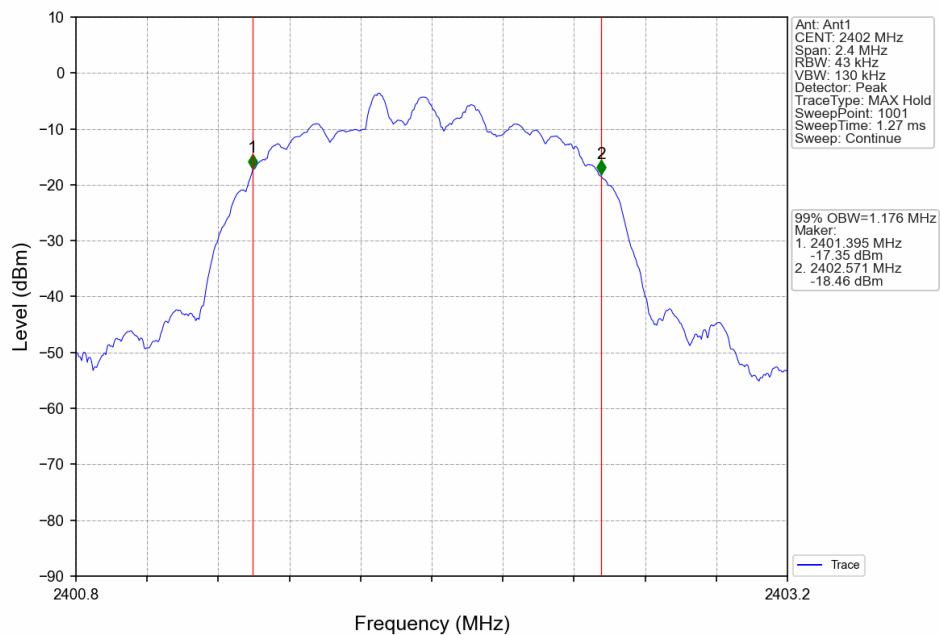
Pi/4DQPSK 2DH5 MCH 2441MHz Ant1 NTN



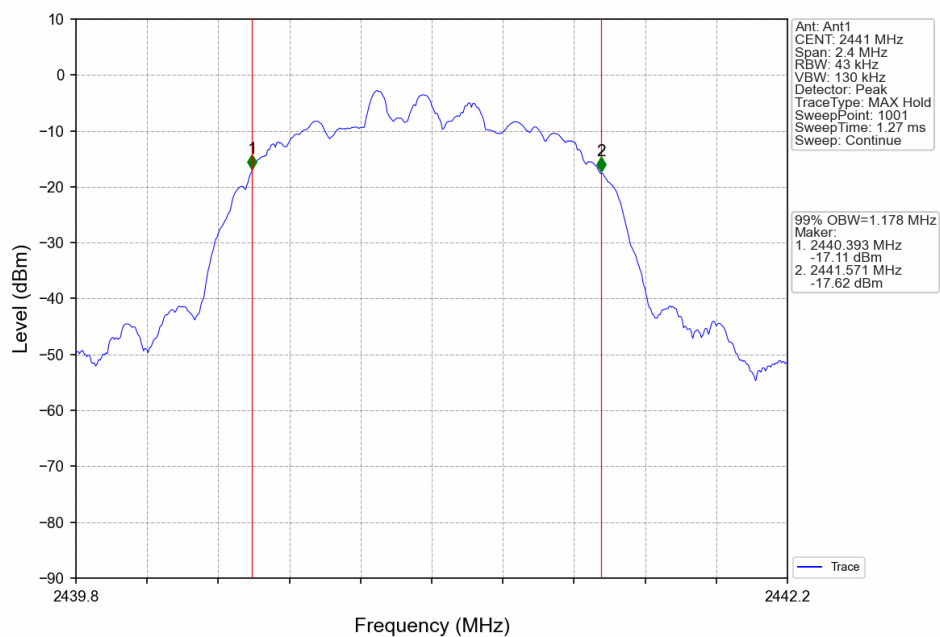
Pi/4DQPSK 2DH5 HCH 2480MHz Ant1 NTN

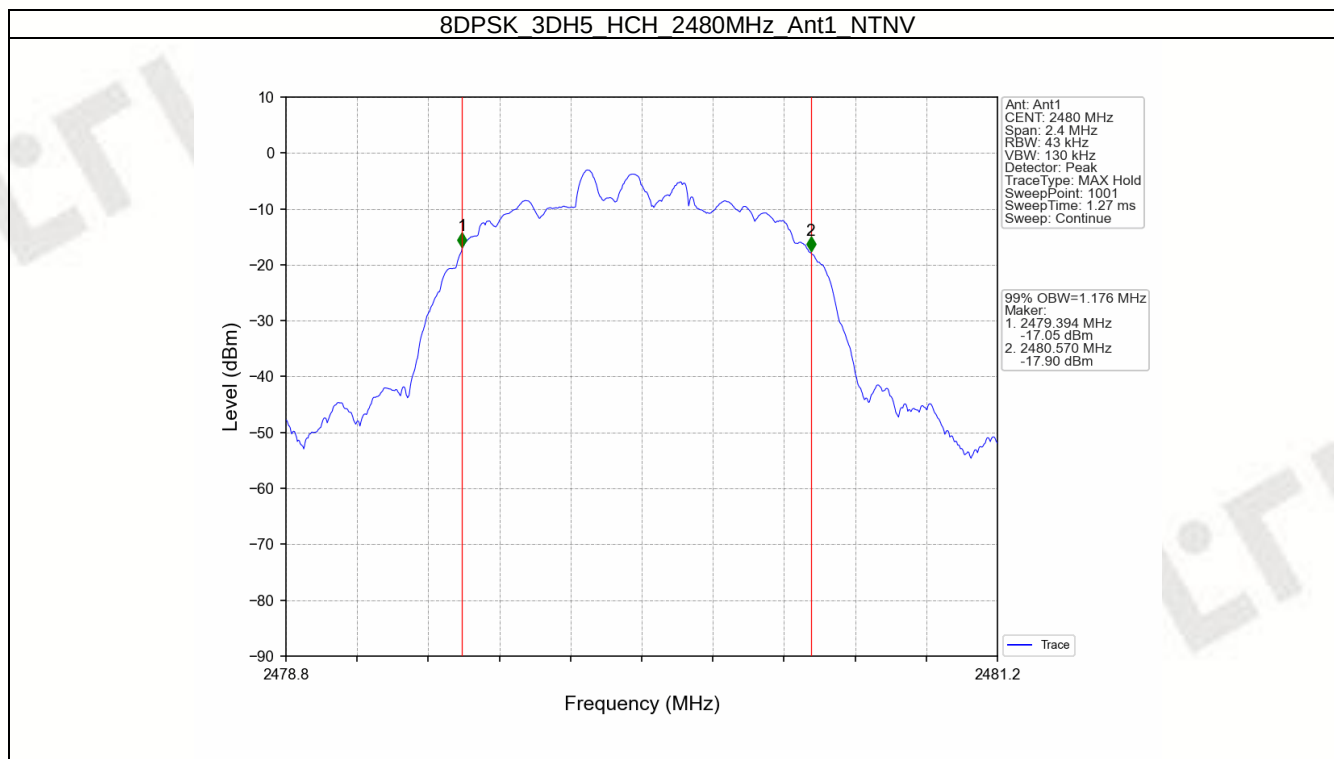


8DPSK 3DH5 LCH 2402MHz Ant1 NTV



8DPSK 3DH5 MCH 2441MHz Ant1 NTV



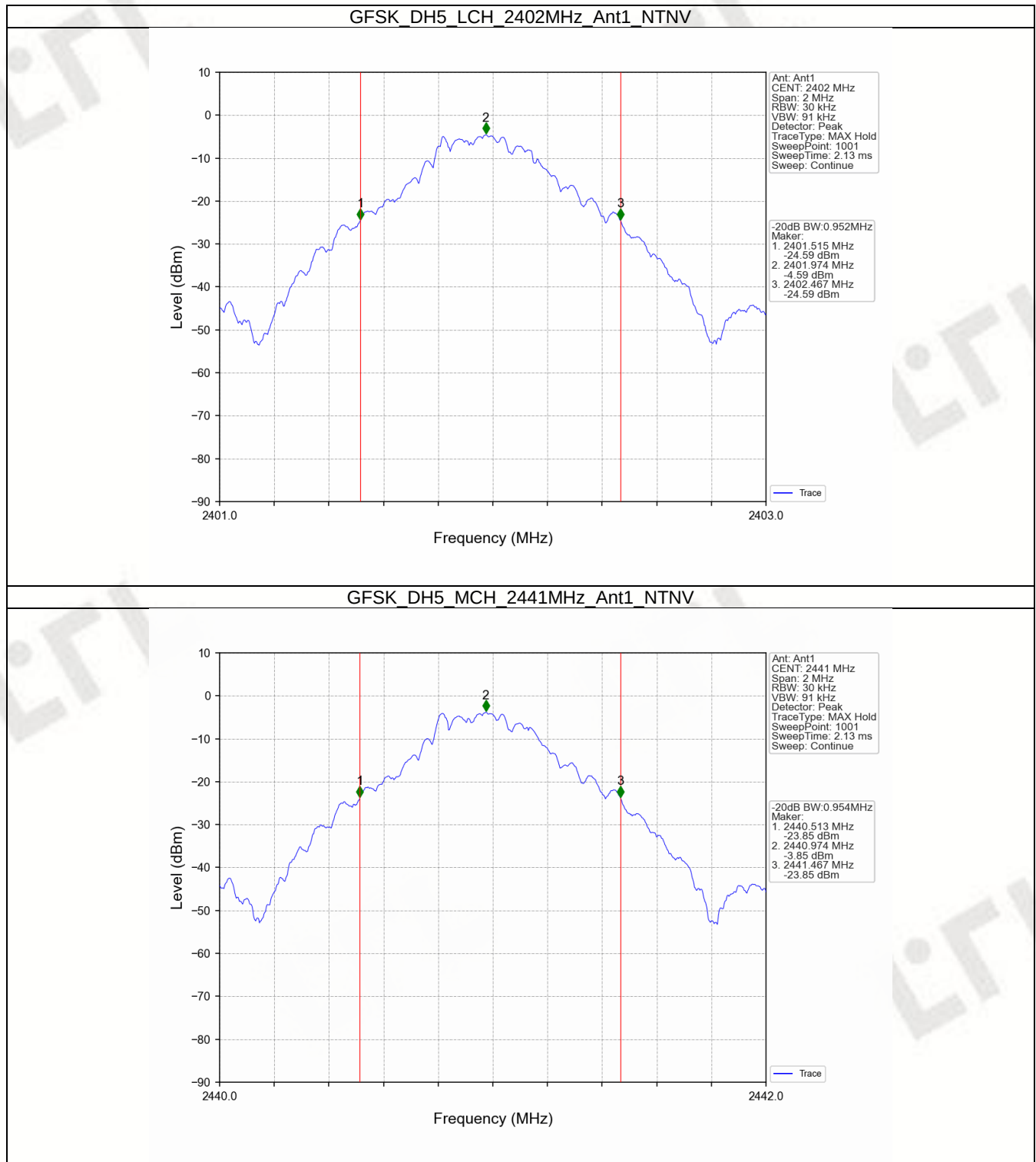


## 1.2 20dB BW

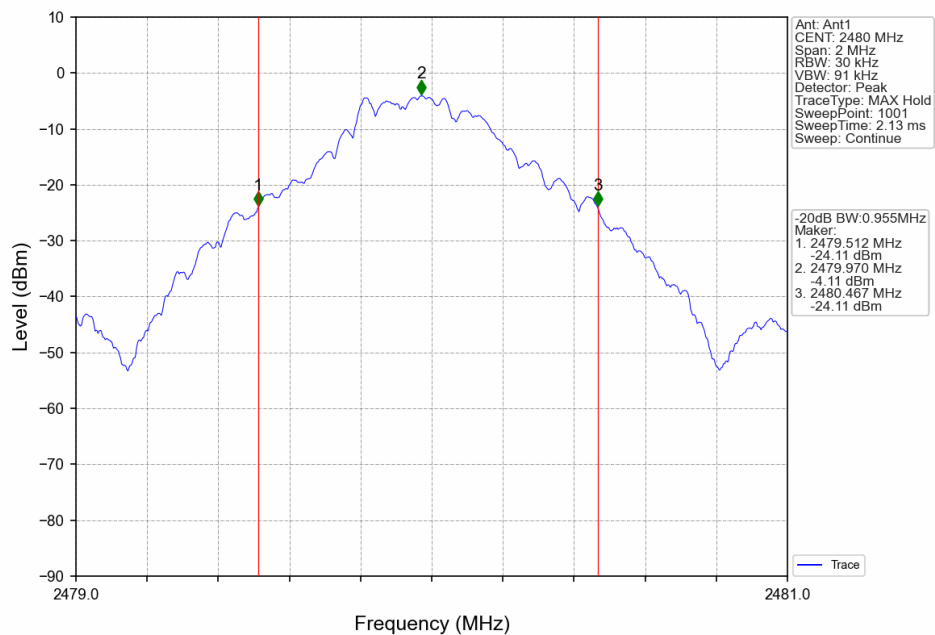
## 1.2.1 Test Result

| Mode      | TX Type | Frequency (MHz) | Packet Type | ANT | 20dB Bandwidth (MHz) | Verdict |
|-----------|---------|-----------------|-------------|-----|----------------------|---------|
|           |         |                 |             |     | Result               |         |
| GFSK      | SISO    | 2402            | DH5         | 1   | 0.952                | Pass    |
|           |         | 2441            | DH5         | 1   | 0.954                | Pass    |
|           |         | 2480            | DH5         | 1   | 0.955                | Pass    |
| Pi/4DQPSK | SISO    | 2402            | 2DH5        | 1   | 1.287                | Pass    |
|           |         | 2441            | 2DH5        | 1   | 1.286                | Pass    |
|           |         | 2480            | 2DH5        | 1   | 1.287                | Pass    |
| 8DPSK     | SISO    | 2402            | 3DH5        | 1   | 1.310                | Pass    |
|           |         | 2441            | 3DH5        | 1   | 1.312                | Pass    |
|           |         | 2480            | 3DH5        | 1   | 1.311                | Pass    |

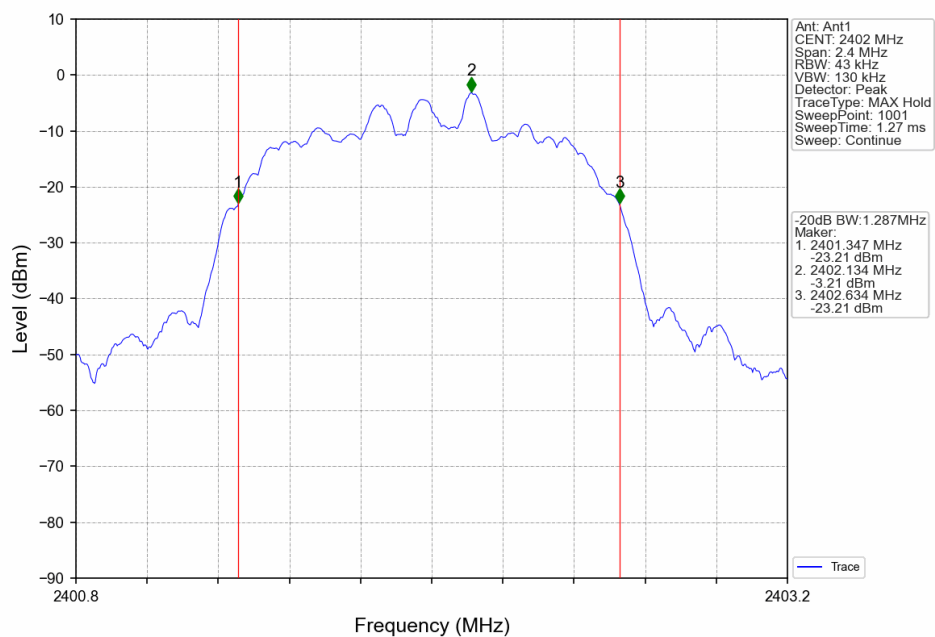
## 1.2.2 Test Graph



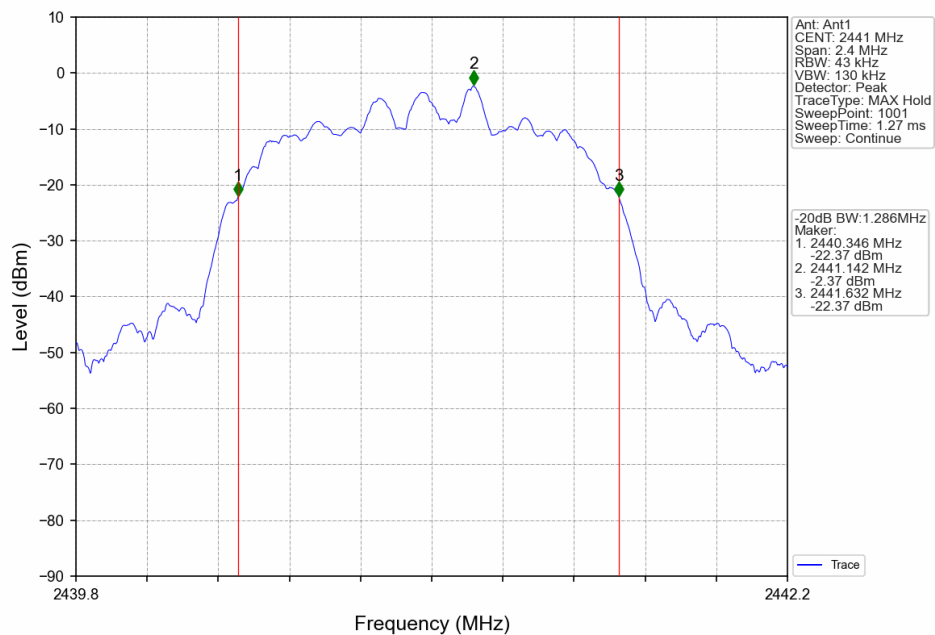
GFSK DH5 HCH 2480MHz Ant1 NTNV



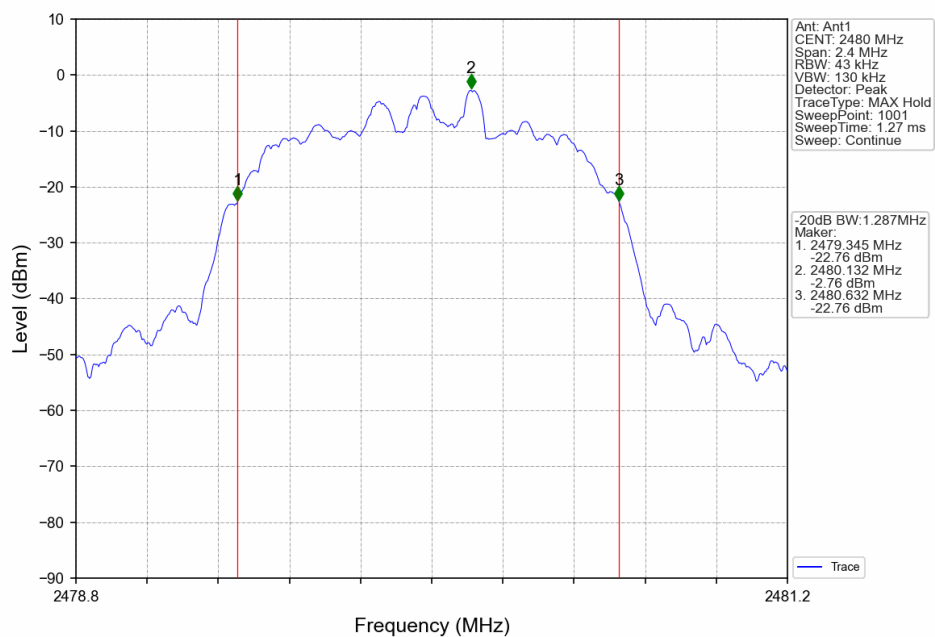
Pi/4DQPSK 2DH5 LCH 2402MHz Ant1 NTNV



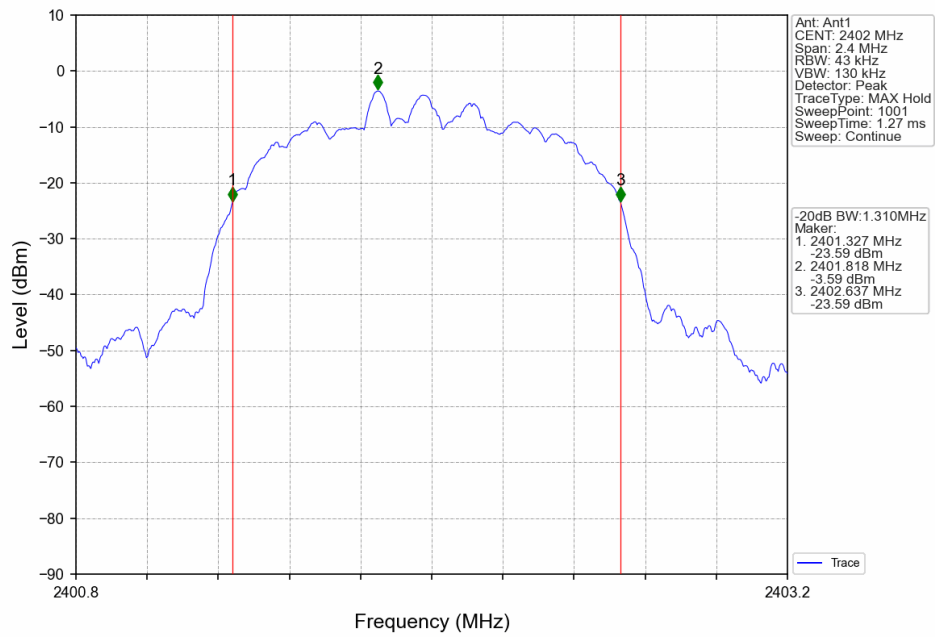
Pi/4DQPSK 2DH5 MCH 2441MHz Ant1 NTN



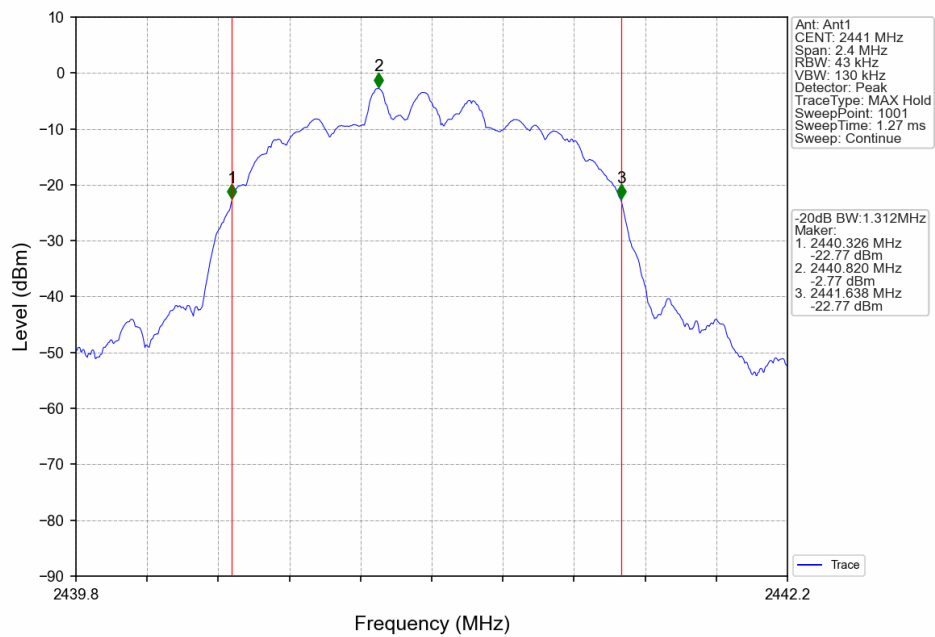
Pi/4DQPSK 2DH5 HCH 2480MHz Ant1 NTN

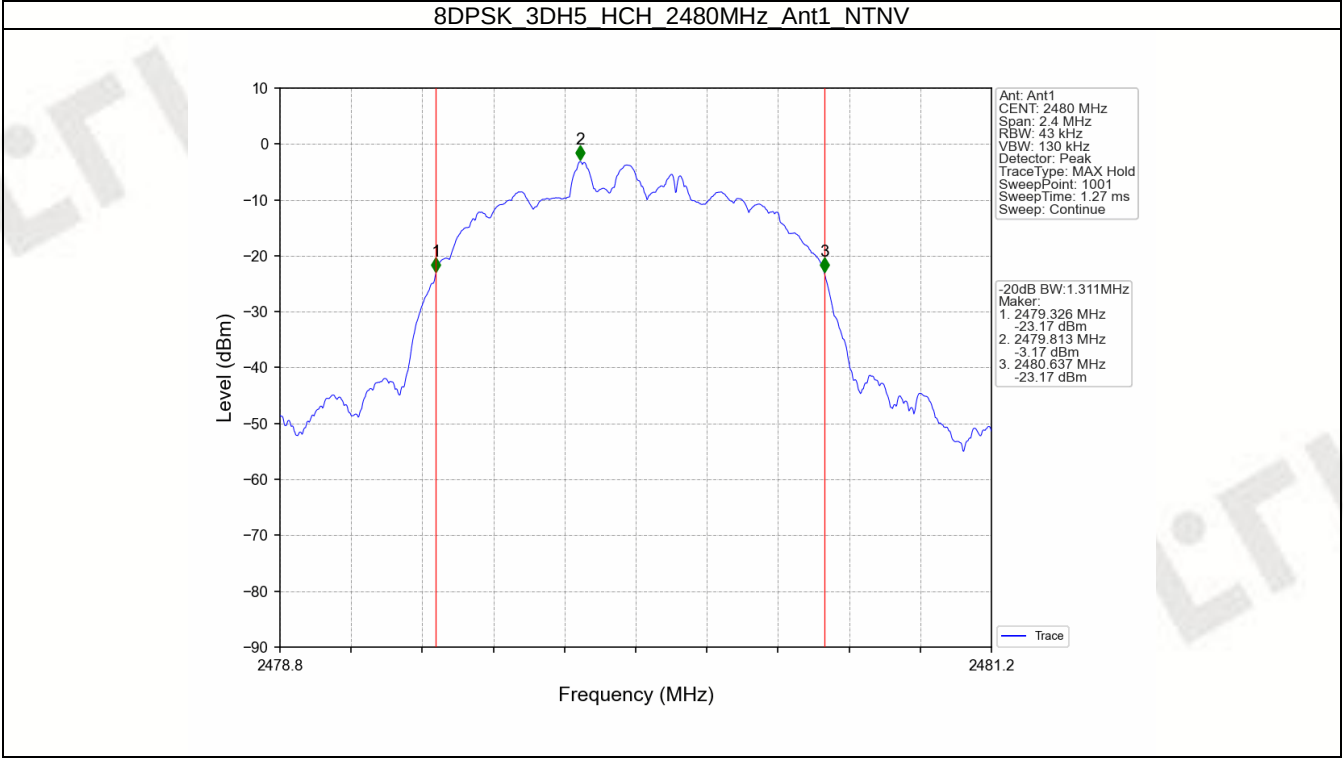


## 8DPSK 3DH5 LCH 2402MHz Ant1 NTVN



## 8DPSK 3DH5 MCH 2441MHz Ant1 NTVN





## 2. Maximum Conducted Output Power

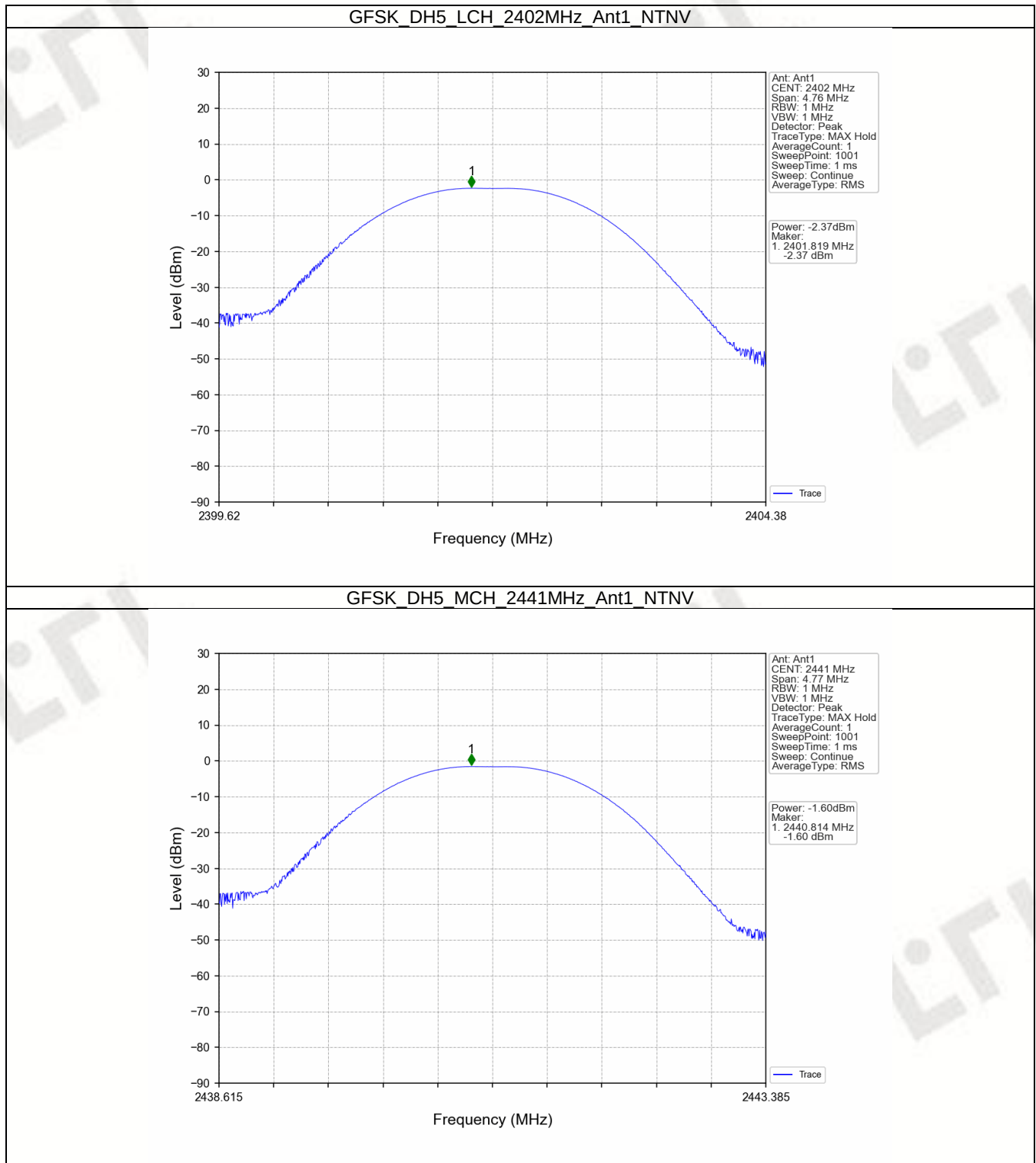
### 2.1 Power

#### 2.1.1 Test Result

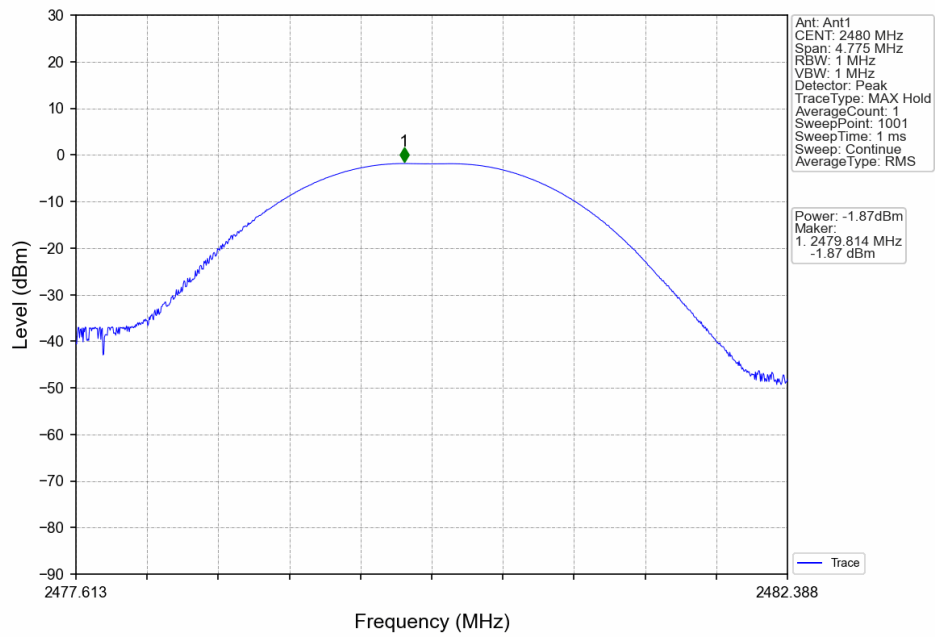
| Mode      | TX Type | Frequency (MHz) | Packet Type | Maximum Peak Conducted Output Power (dBm) |         | Verdict |
|-----------|---------|-----------------|-------------|-------------------------------------------|---------|---------|
|           |         |                 |             | ANT1                                      | Limit   |         |
| GFSK      | SISO    | 2402            | DH5         | -2.37                                     | <=30    | Pass    |
|           |         | 2441            | DH5         | -1.60                                     | <=30    | Pass    |
|           |         | 2480            | DH5         | -1.87                                     | <=30    | Pass    |
| PI/4DQPSK | SISO    | 2402            | 2DH5        | -1.48                                     | <=20.97 | Pass    |
|           |         | 2441            | 2DH5        | -0.68                                     | <=20.97 | Pass    |
|           |         | 2480            | 2DH5        | -0.95                                     | <=20.97 | Pass    |
| 8DPSK     | SISO    | 2402            | 3DH5        | -1.05                                     | <=20.97 | Pass    |
|           |         | 2441            | 3DH5        | -0.26                                     | <=20.97 | Pass    |
|           |         | 2480            | 3DH5        | -0.52                                     | <=20.97 | Pass    |

Note1: Antenna Gain: Ant1: -0.63dBi;

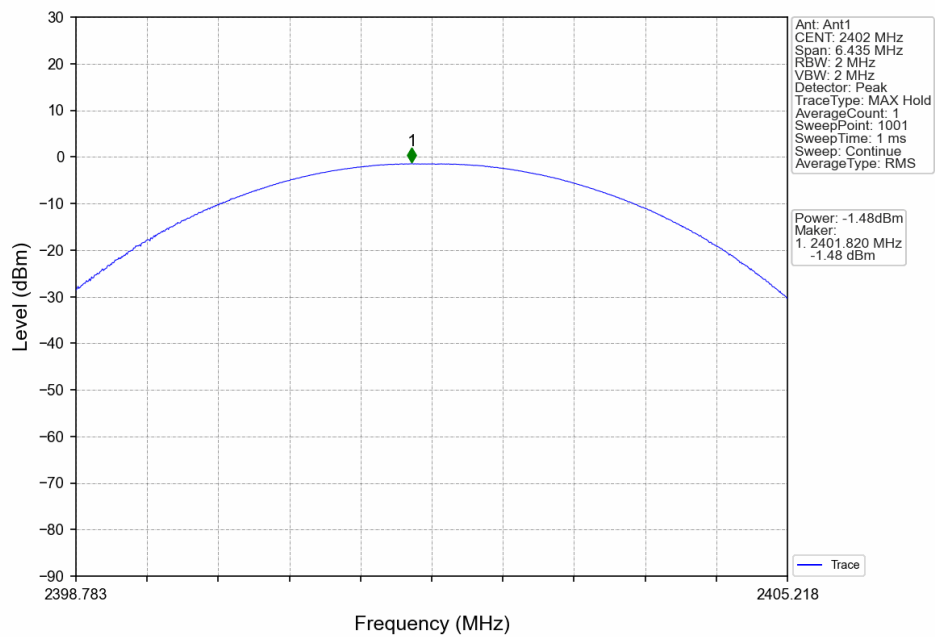
## 2.1.1.2 Test Graph



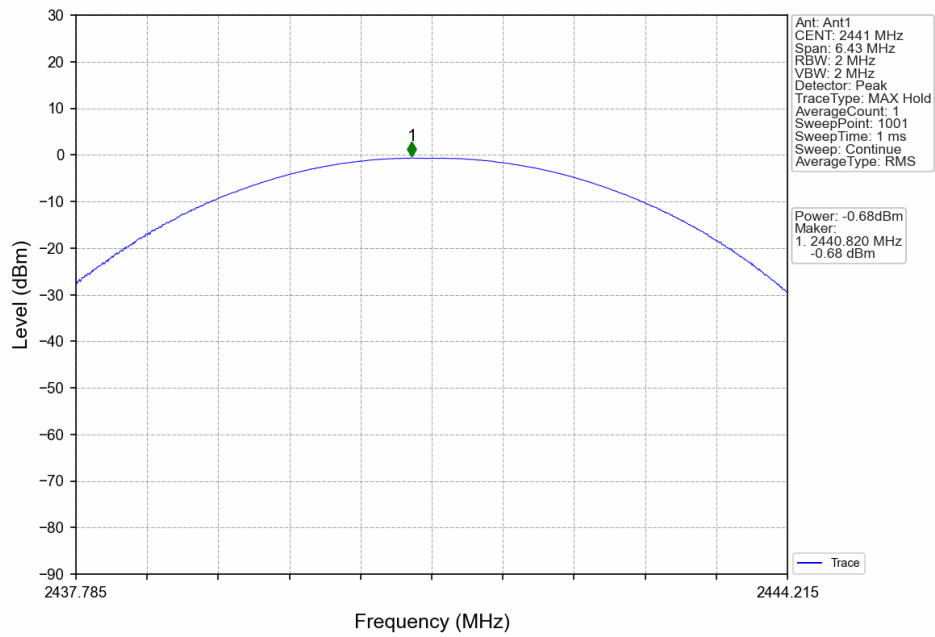
## GFSK DH5 HCH 2480MHz Ant1 NTN



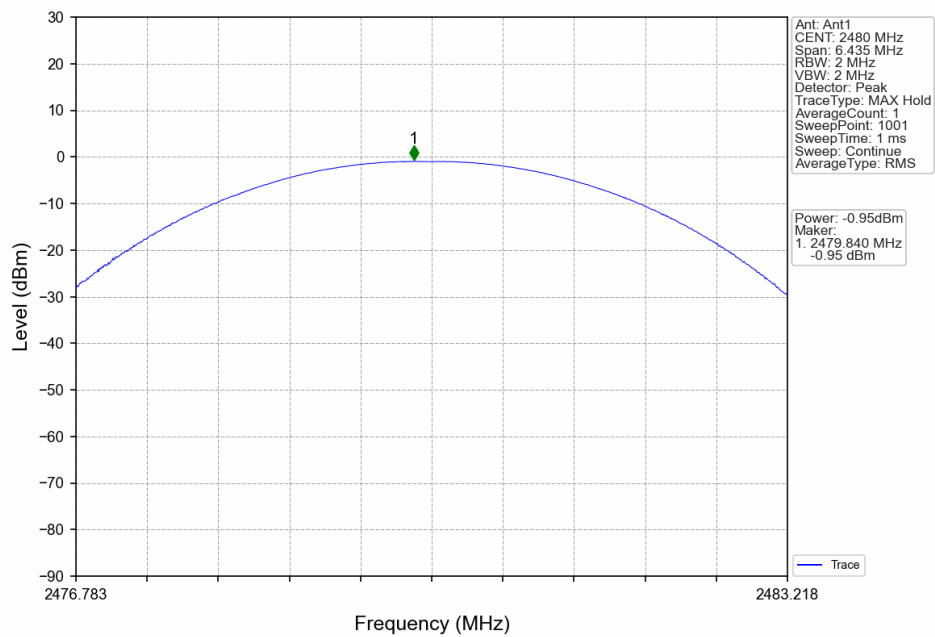
## Pi/4DQPSK 2DH5 LCH 2402MHz Ant1 NTN



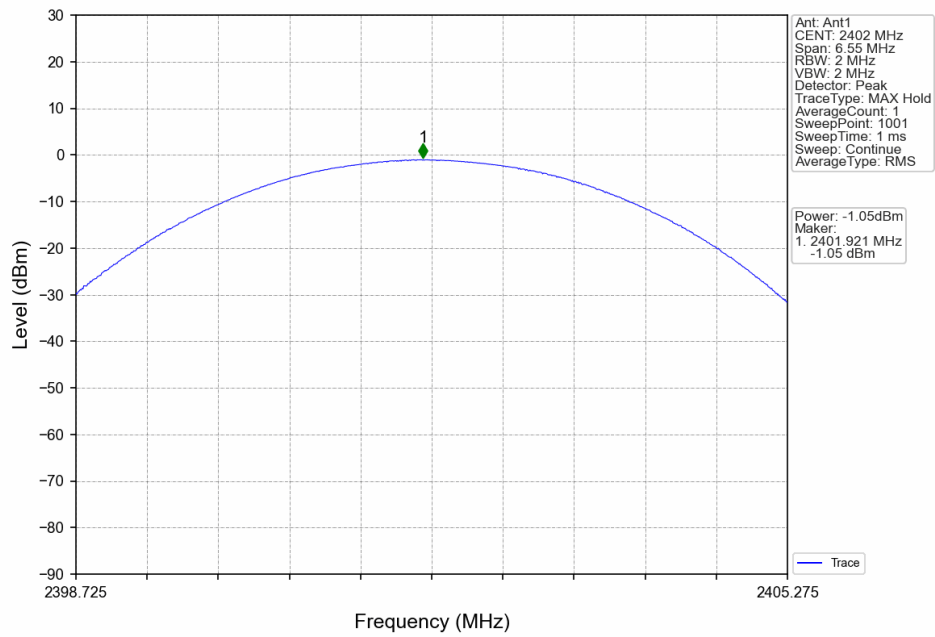
Pi/4DQPSK 2DH5 MCH 2441MHz Ant1 NTNV



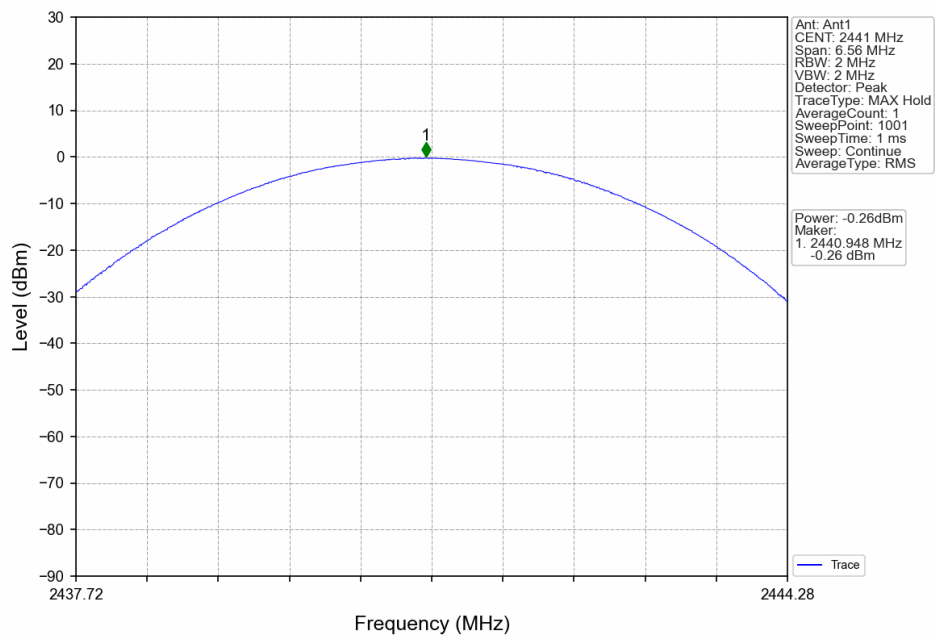
Pi/4DQPSK 2DH5 HCH 2480MHz Ant1 NTNV

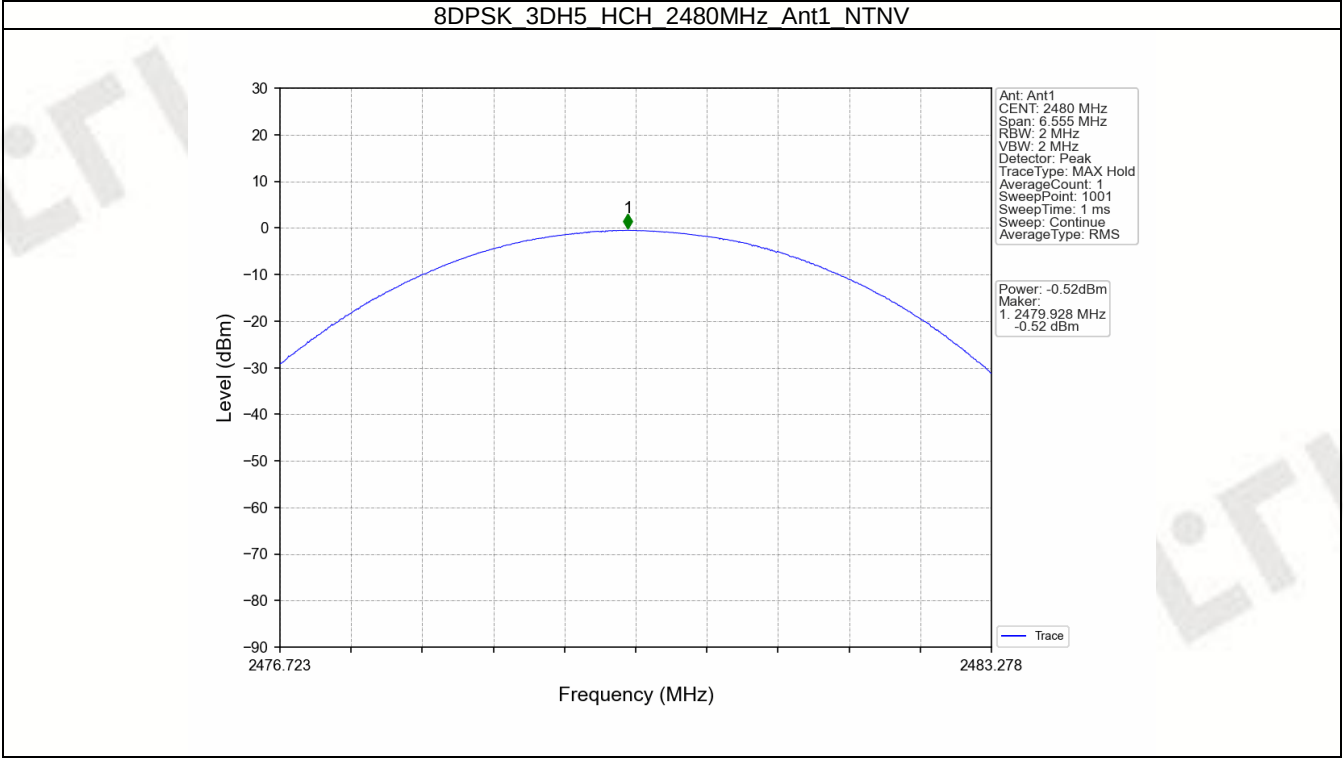


## 8DPSK 3DH5 LCH 2402MHz Ant1 NTN



## 8DPSK 3DH5 MCH 2441MHz Ant1 NTN





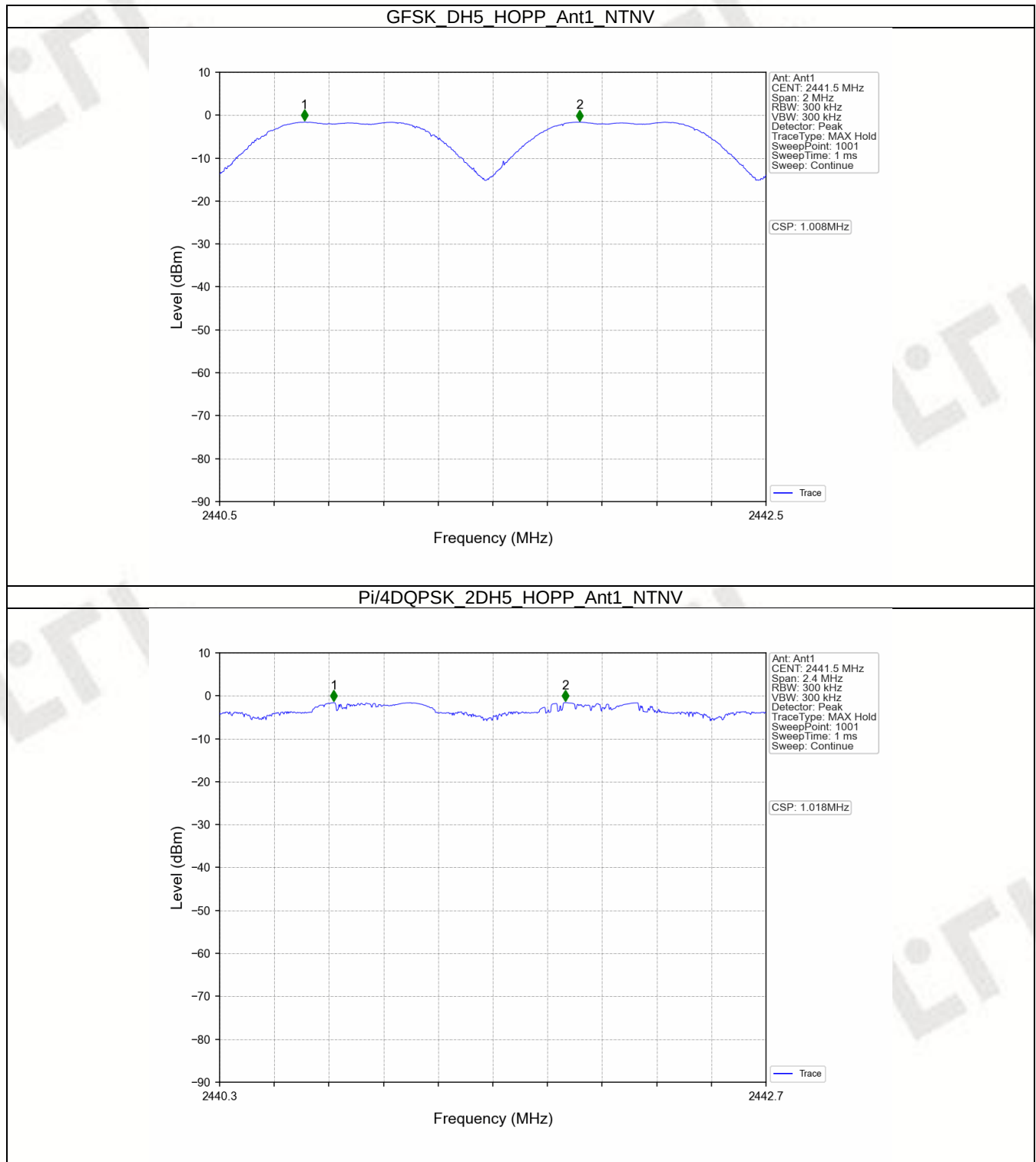
### 3. Carrier Frequency Separation

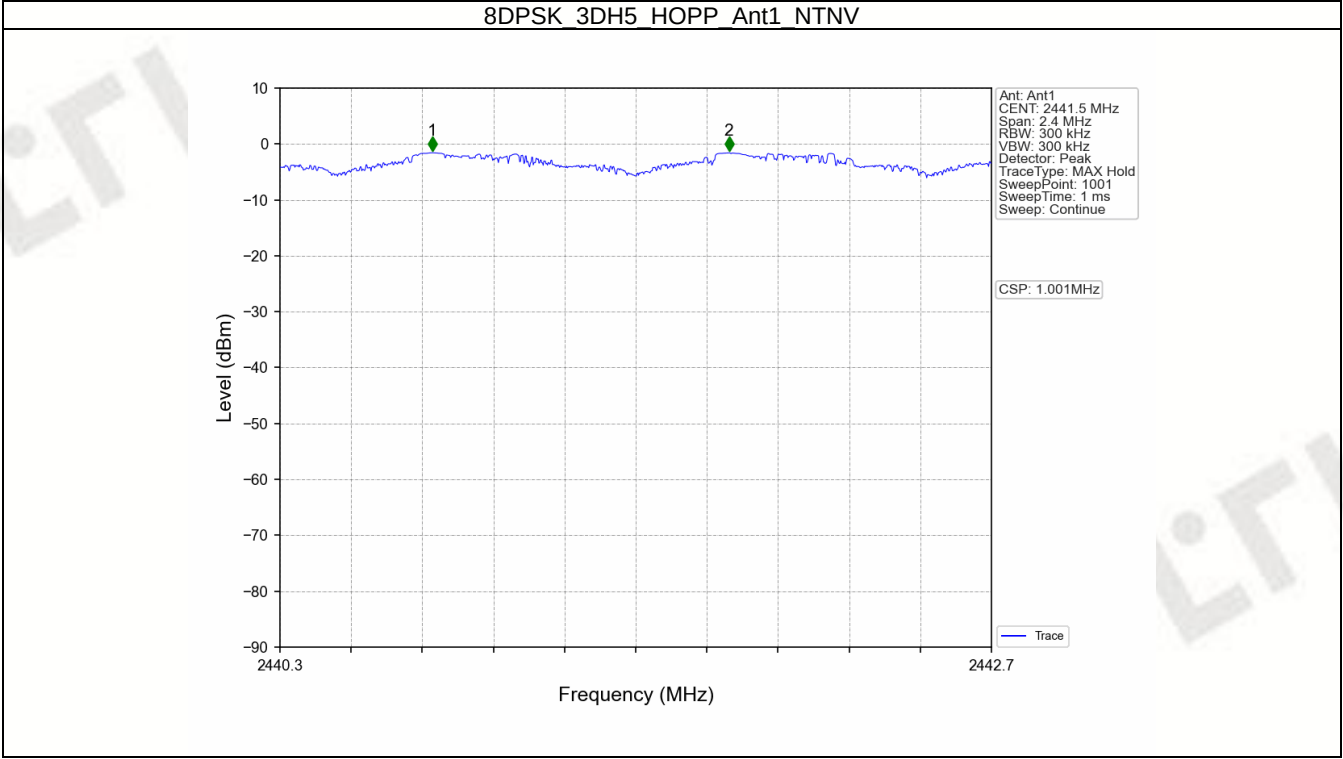
#### 3.1 Ant1

##### 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         | 1.008                    | 0.955                | $\geq 0.955$ | Pass    |
| Pi/4DQPSK | SISO    | HOPP            | 2DH5        | 1.018                    | 1.287                | $\geq 0.858$ | Pass    |
| 8DPSK     | SISO    | HOPP            | 3DH5        | 1.001                    | 1.312                | $\geq 0.875$ | Pass    |

## 3.1.2 Test Graph





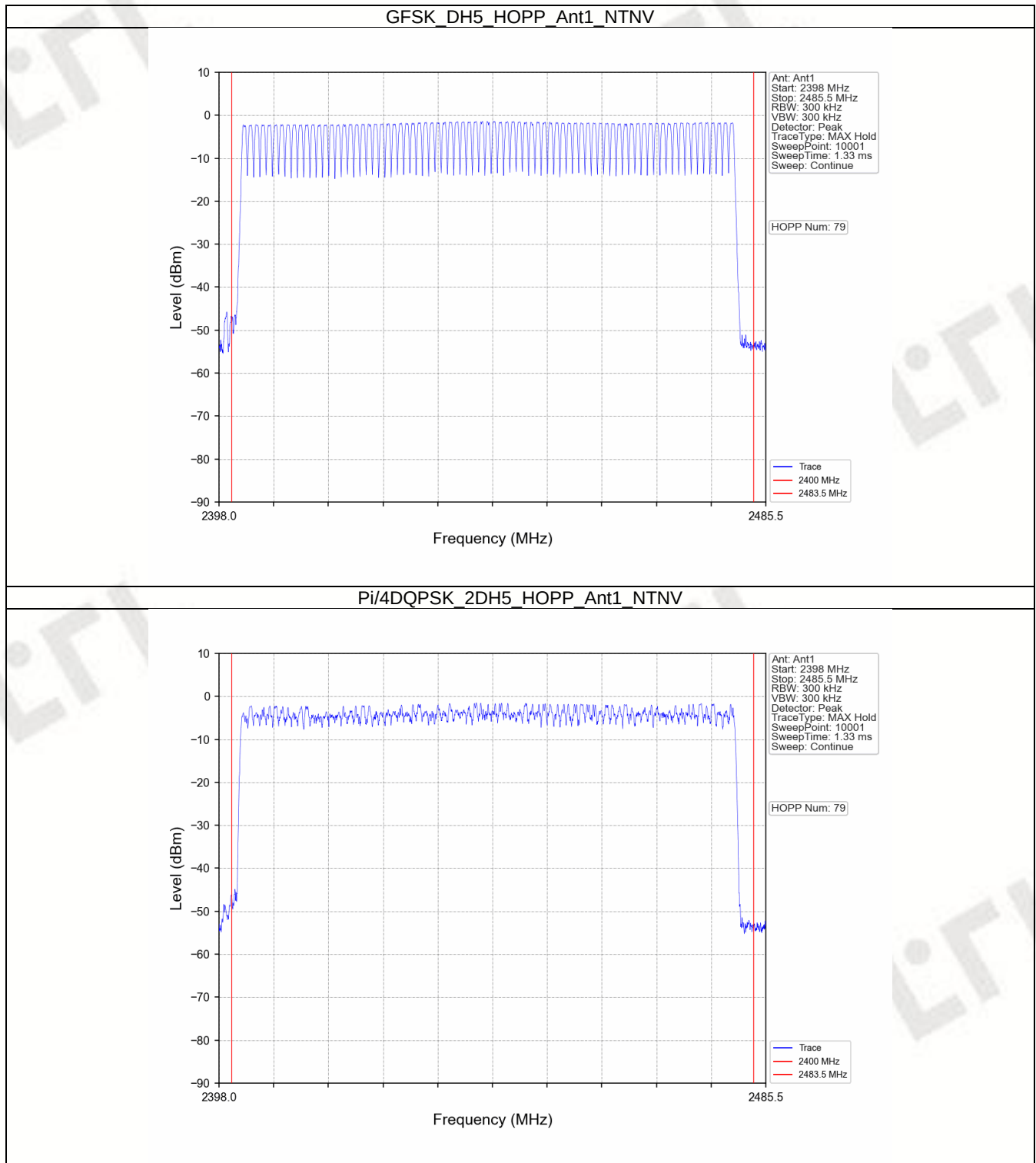
## 4. Number of Hopping Frequencies

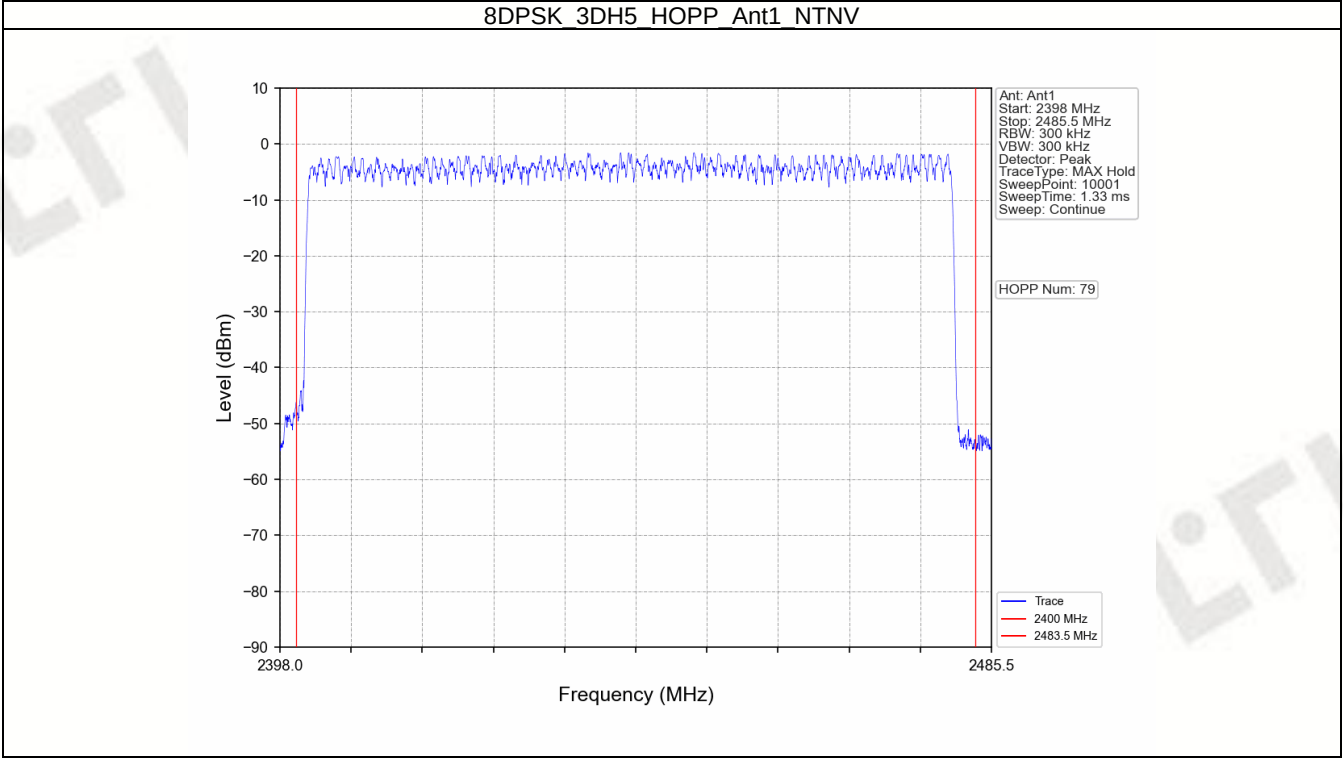
### 4.1 HoppNum

#### 4.1.1 Test Result

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

## 4.1.2 Test Graph





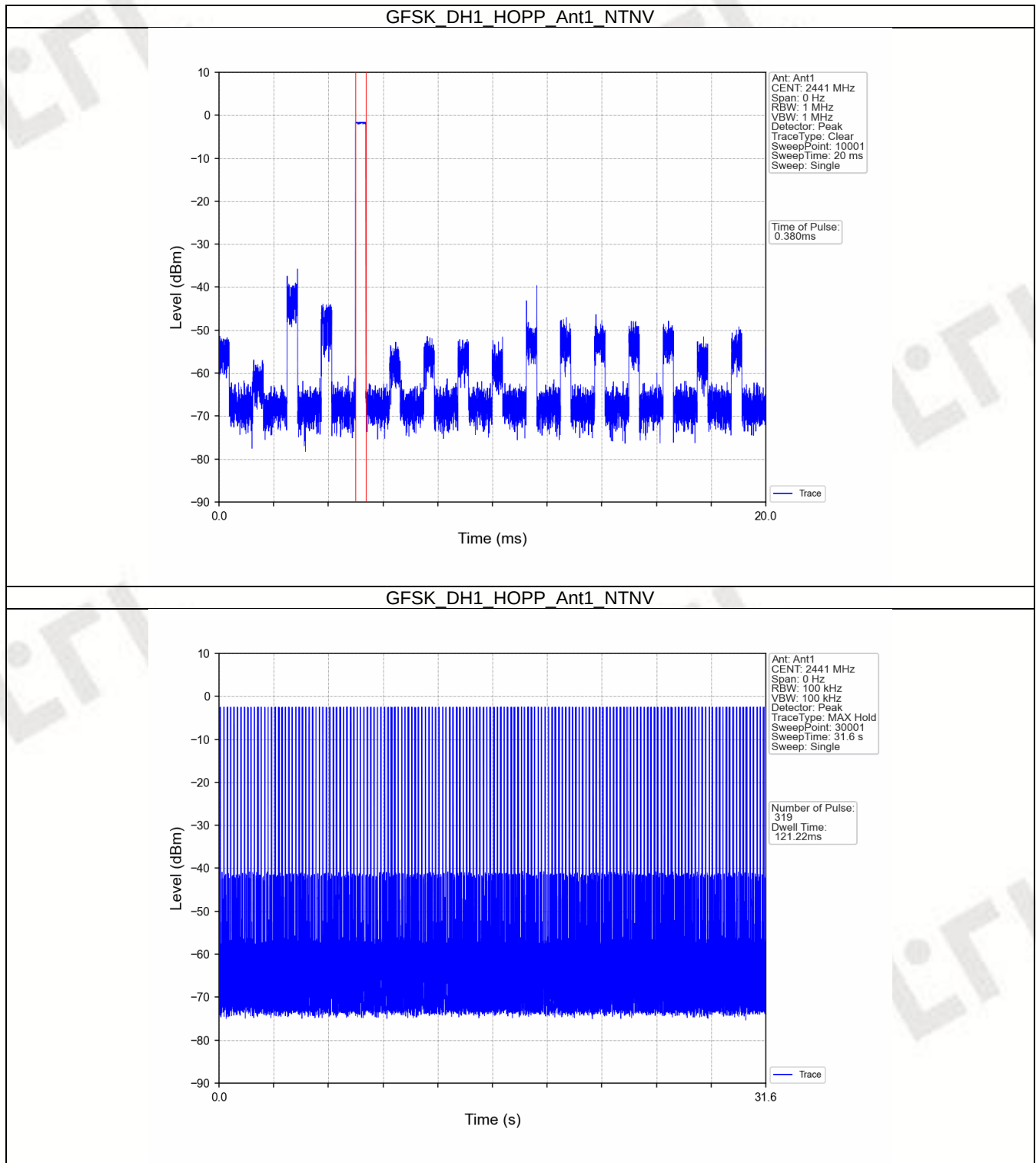
## 5. Time of Occupancy (Dwell Time)

### 5.1 Ant1

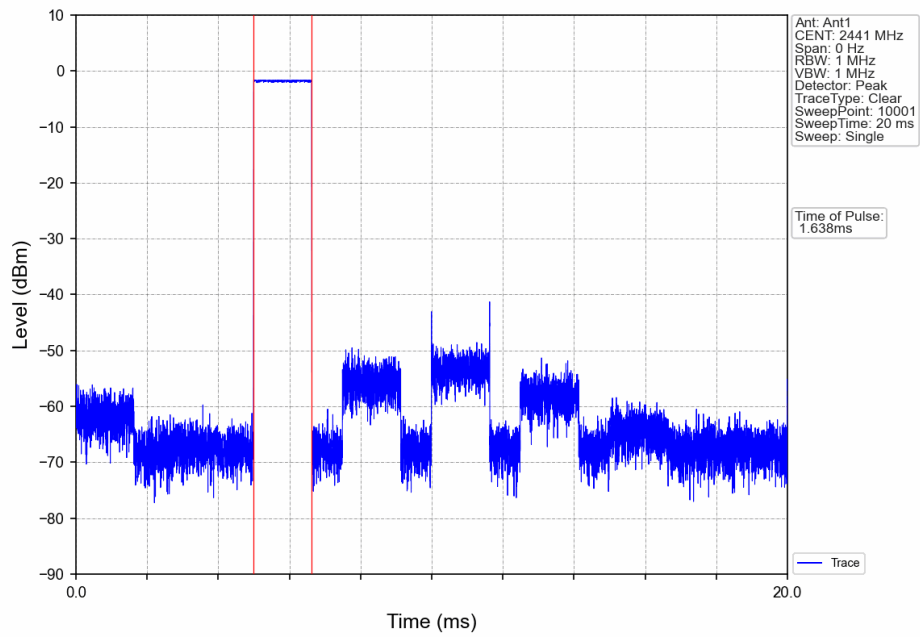
#### 5.1.1 Test Result

| 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         | 0.380                         | 31.600                 | 319                                | 121.220         | <=400      | Pass    |
|           |         |                 | DH3         | 1.638                         | 31.600                 | 166                                | 271.908         | <=400      | Pass    |
|           |         |                 | DH5         | 2.886                         | 31.600                 | 127                                | 366.522         | <=400      | Pass    |
| Pi/4DQPSK | SISO    | HOPP            | 2DH1        | 0.390                         | 31.600                 | 318                                | 124.020         | <=400      | Pass    |
|           |         |                 | 2DH3        | 1.640                         | 31.600                 | 160                                | 262.400         | <=400      | Pass    |
|           |         |                 | 2DH5        | 2.894                         | 31.600                 | 105                                | 303.870         | <=400      | Pass    |
| 8DPSK     | SISO    | HOPP            | 3DH1        | 0.388                         | 31.600                 | 318                                | 123.384         | <=400      | Pass    |
|           |         |                 | 3DH3        | 1.644                         | 31.600                 | 164                                | 269.616         | <=400      | Pass    |
|           |         |                 | 3DH5        | 2.892                         | 31.600                 | 106                                | 306.552         | <=400      | Pass    |

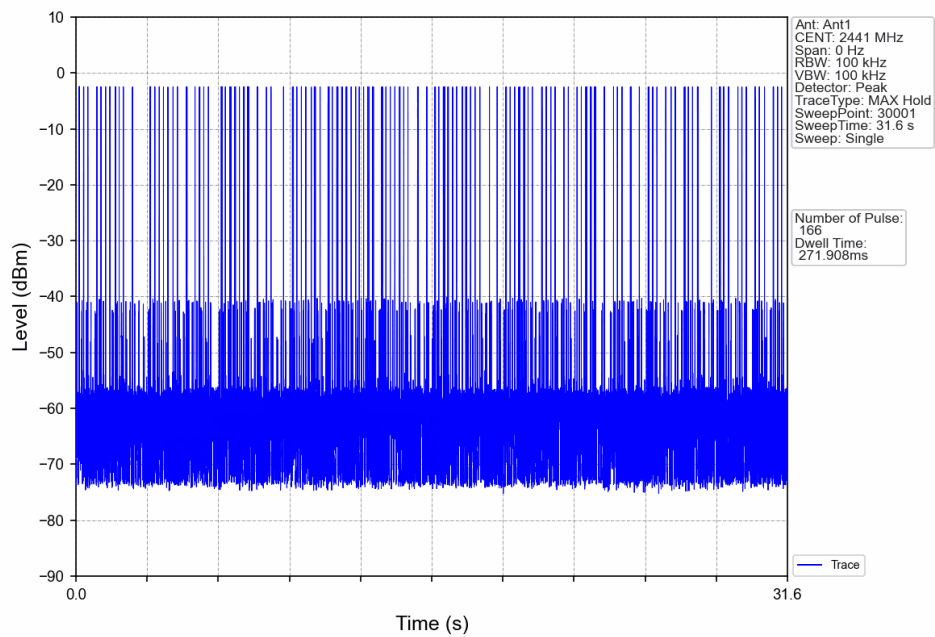
## 5.1.2 Test Graph

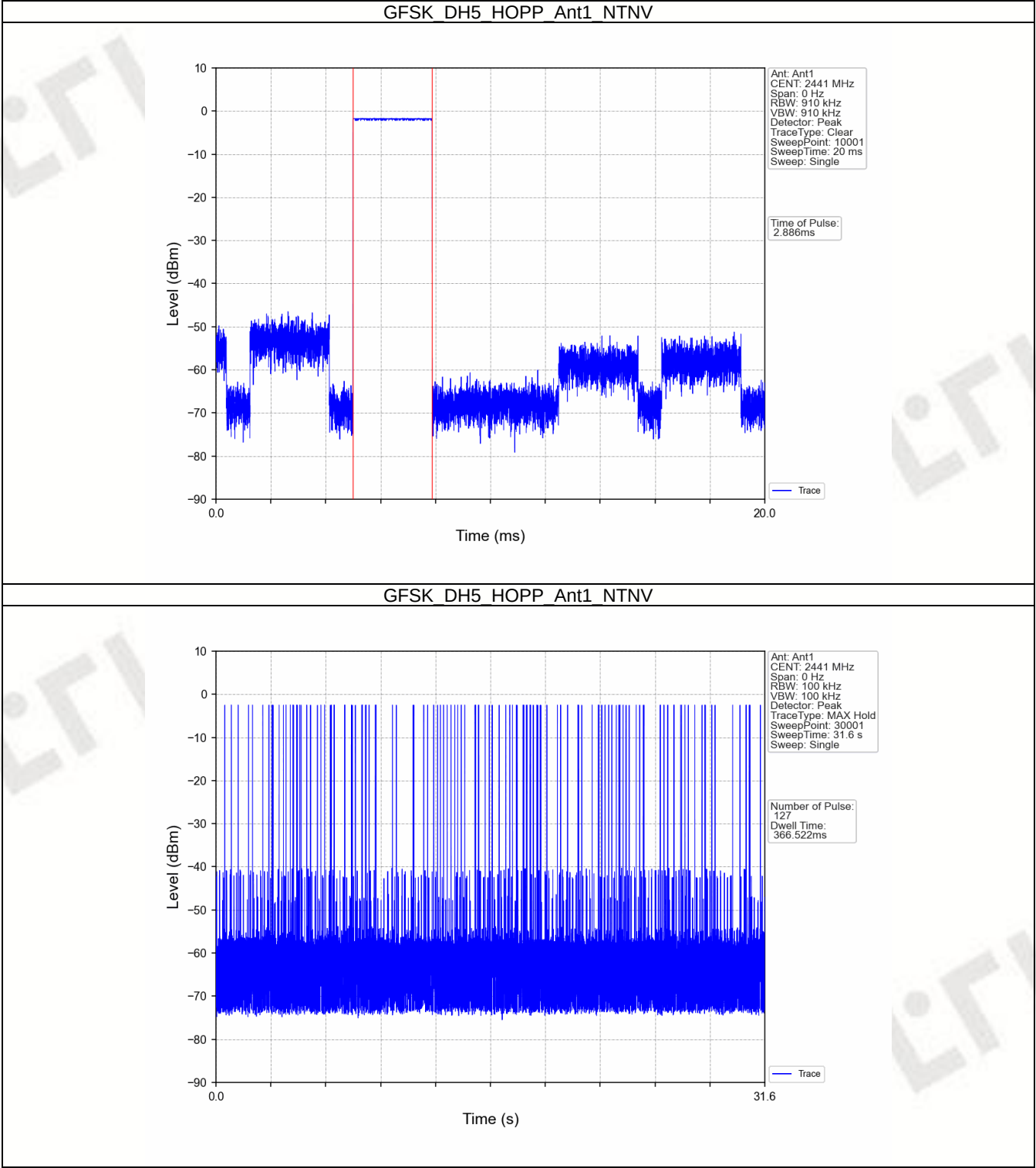


GFSK DH3 HOPP Ant1 NTN

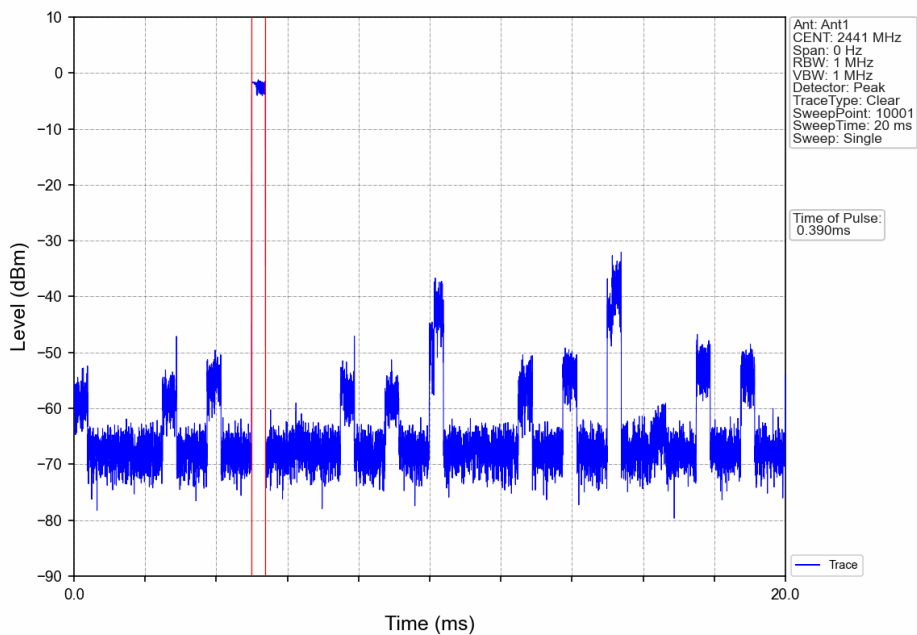


GFSK DH3 HOPP Ant1 NTN

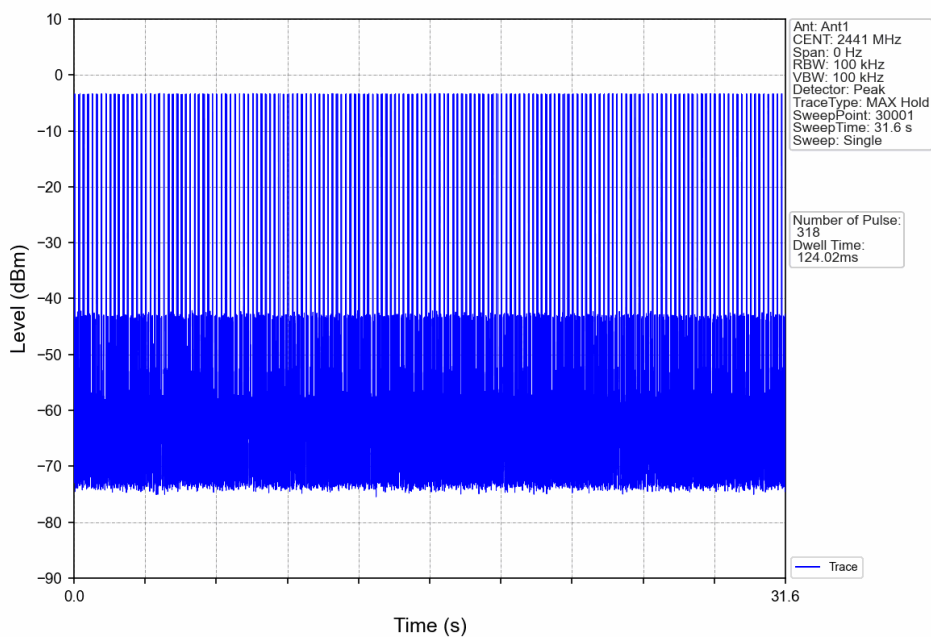




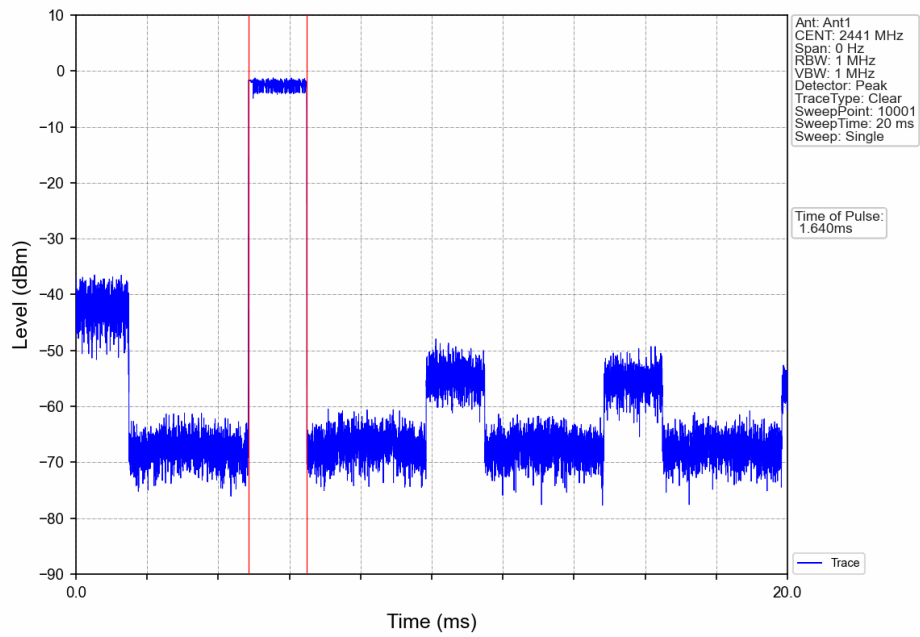
Pi/4DQPSK 2DH1 HOPP Ant1 NTN



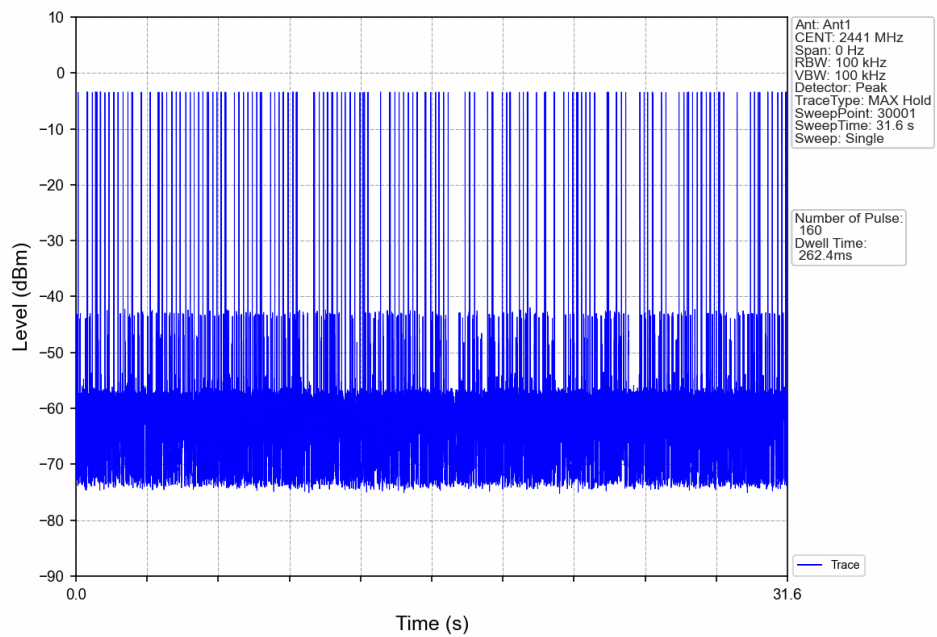
Pi/4DQPSK 2DH1 HOPP Ant1 NTN



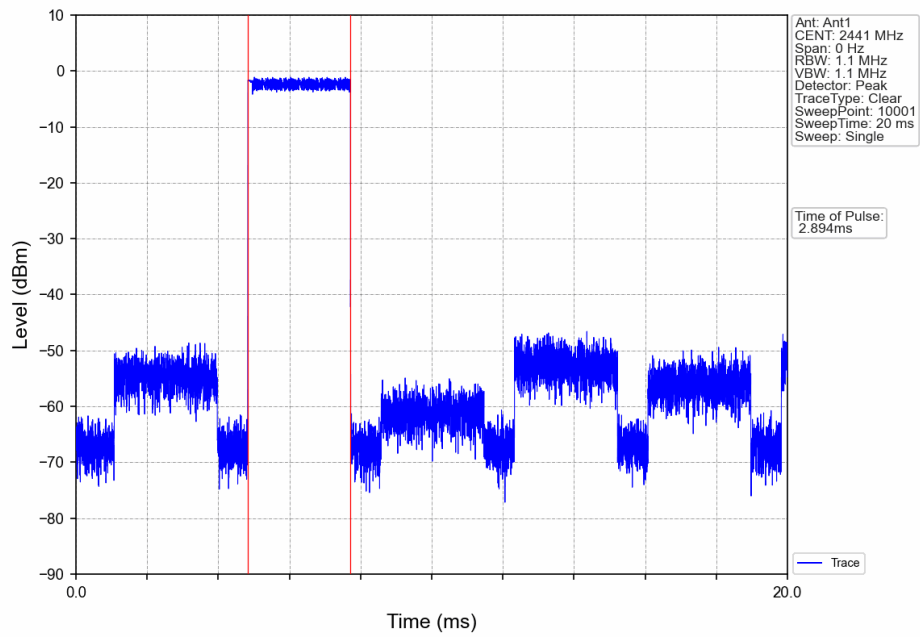
Pi/4DQPSK 2DH3 HOPP Ant1 NTN



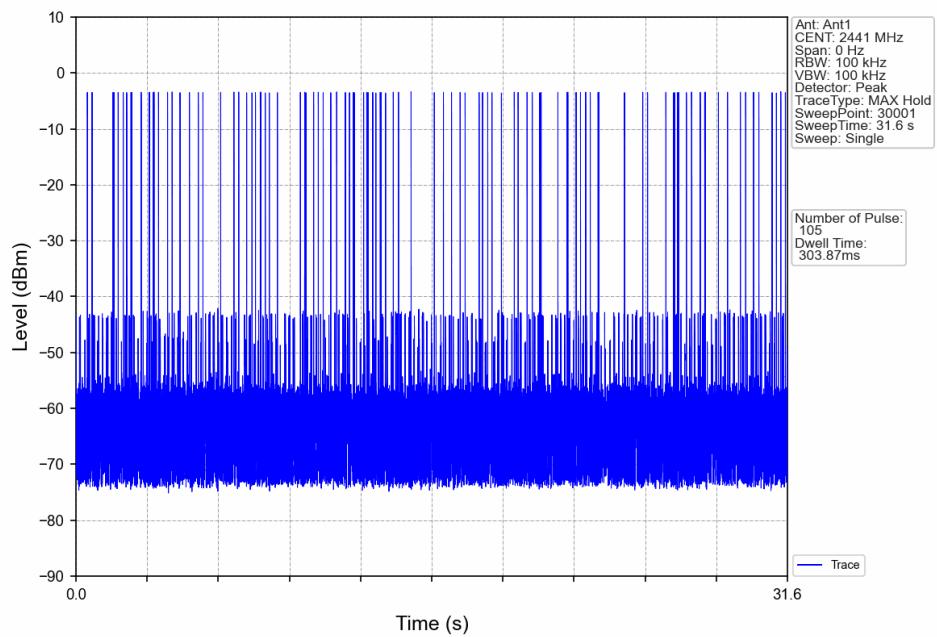
Pi/4DQPSK 2DH3 HOPP Ant1 NTN



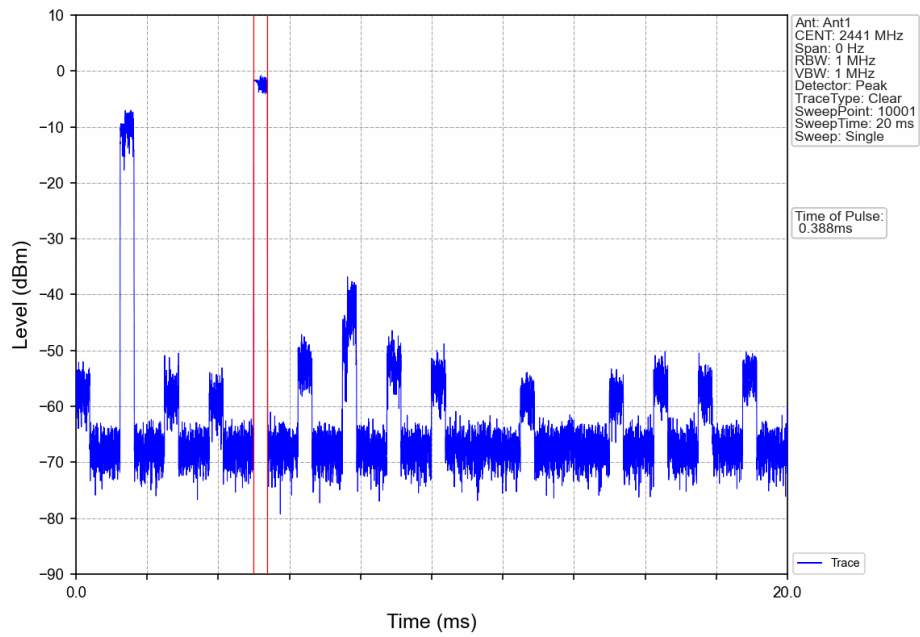
Pi/4DQPSK 2DH5 HOPP Ant1 NTN



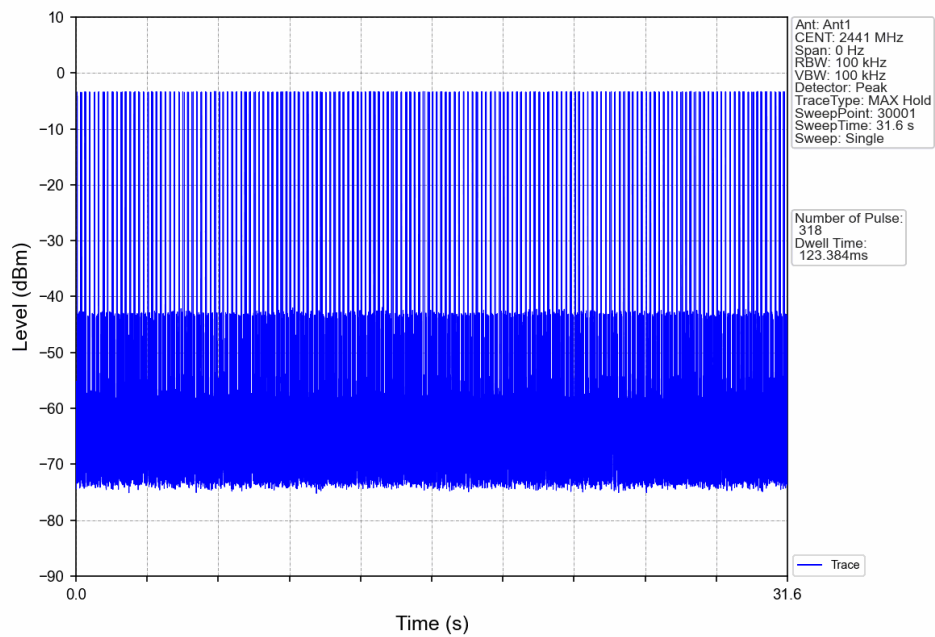
Pi/4DQPSK 2DH5 HOPP Ant1 NTN



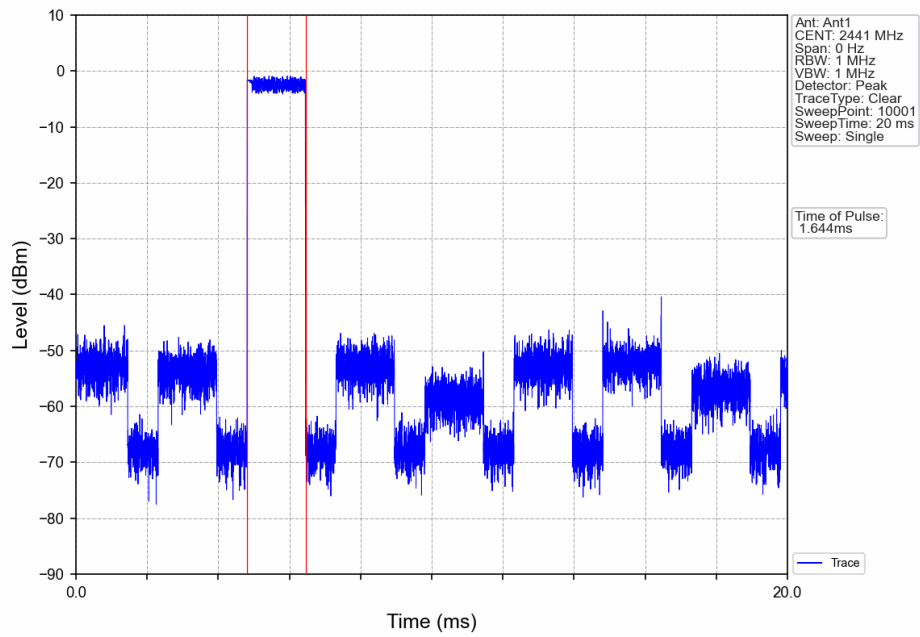
## 8DPSK 3DH1 HOPP Ant1 NTN



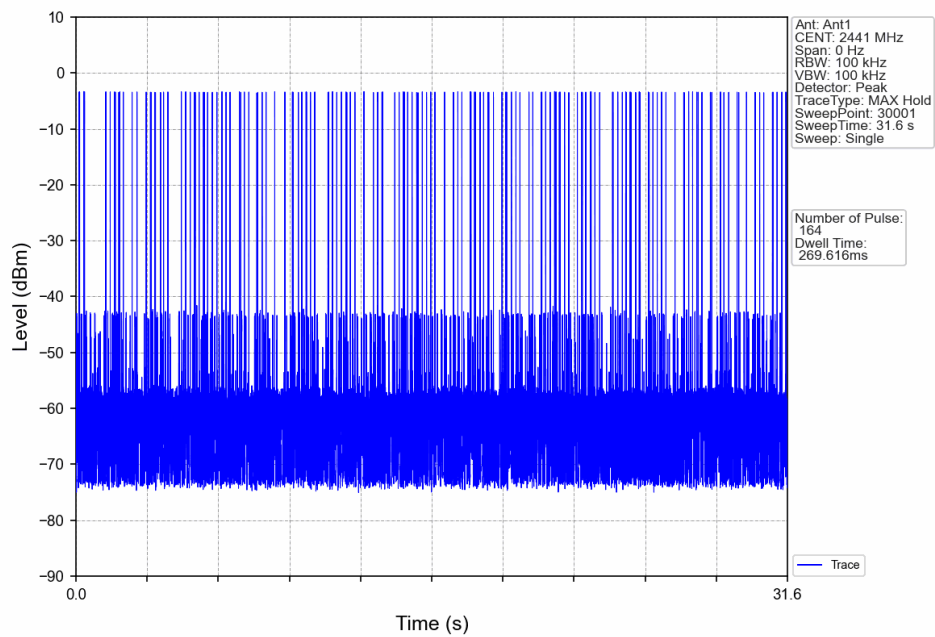
## 8DPSK 3DH1 HOPP Ant1 NTN



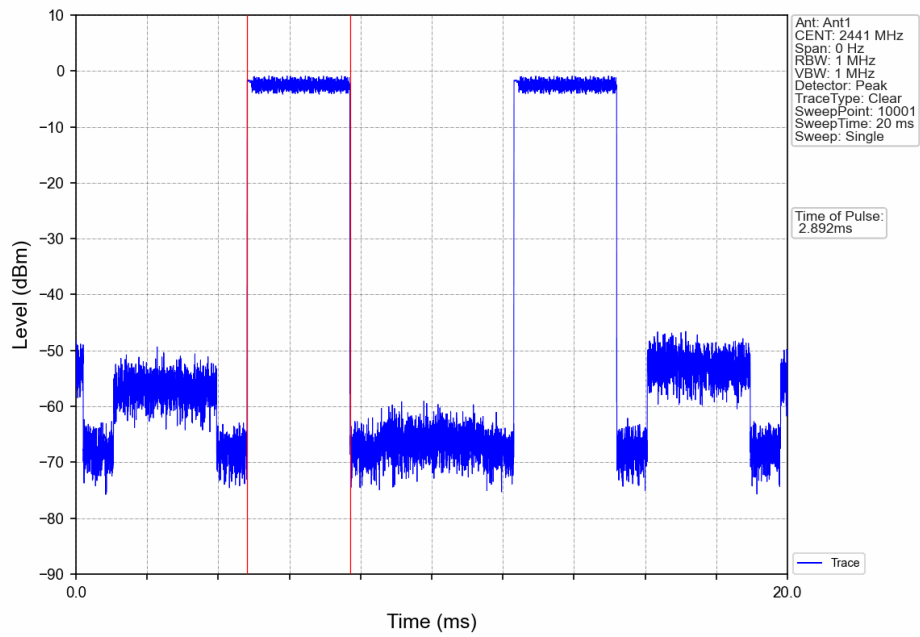
## 8DPSK 3DH3 HOPP Ant1 NTNV



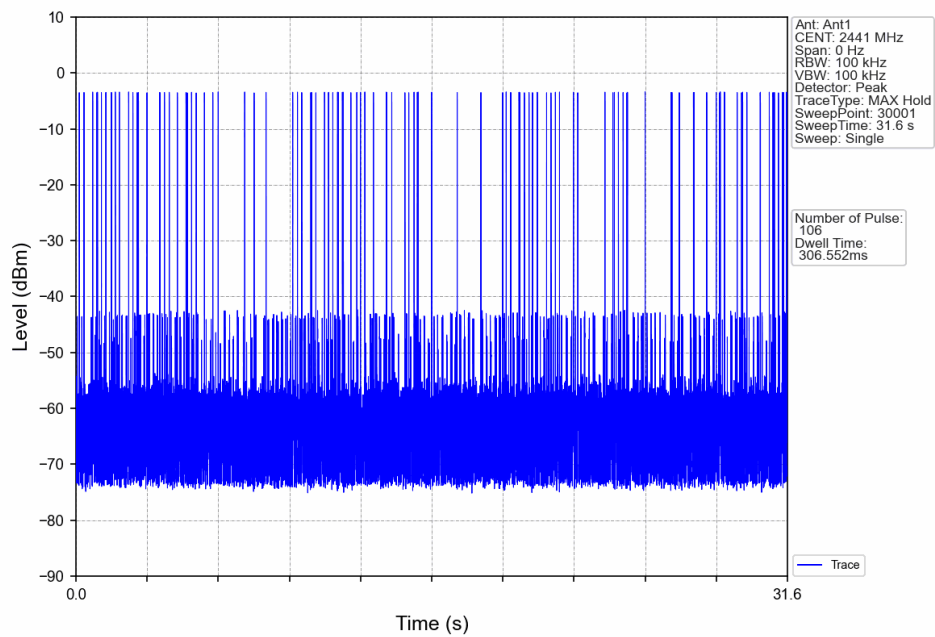
## 8DPSK 3DH3 HOPP Ant1 NTNV



8DPSK 3DH5 HOPP Ant1 NTNV



8DPSK 3DH5 HOPP Ant1 NTNV



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

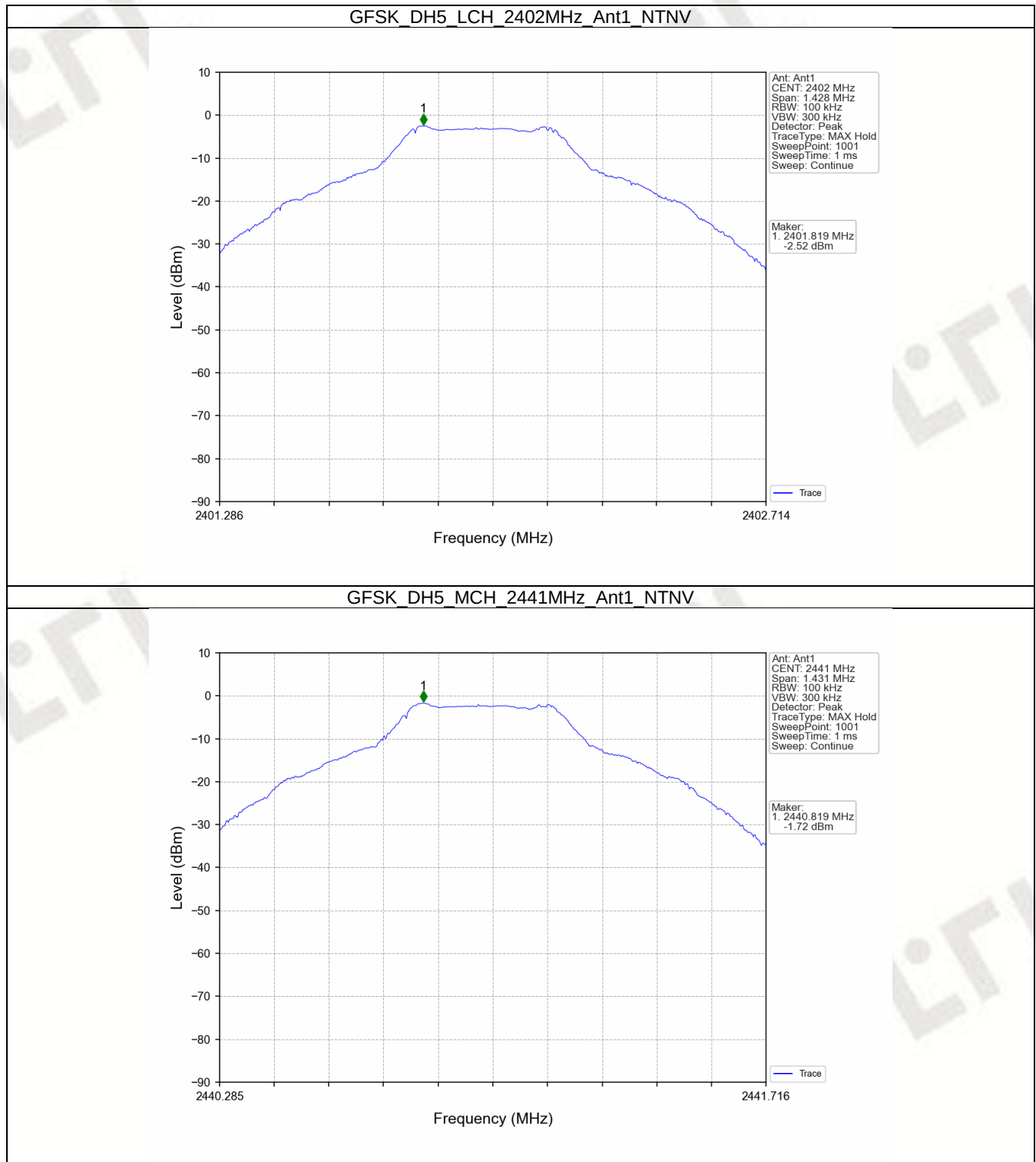
### 6.1 Ref

#### 6.1.1 Test Result

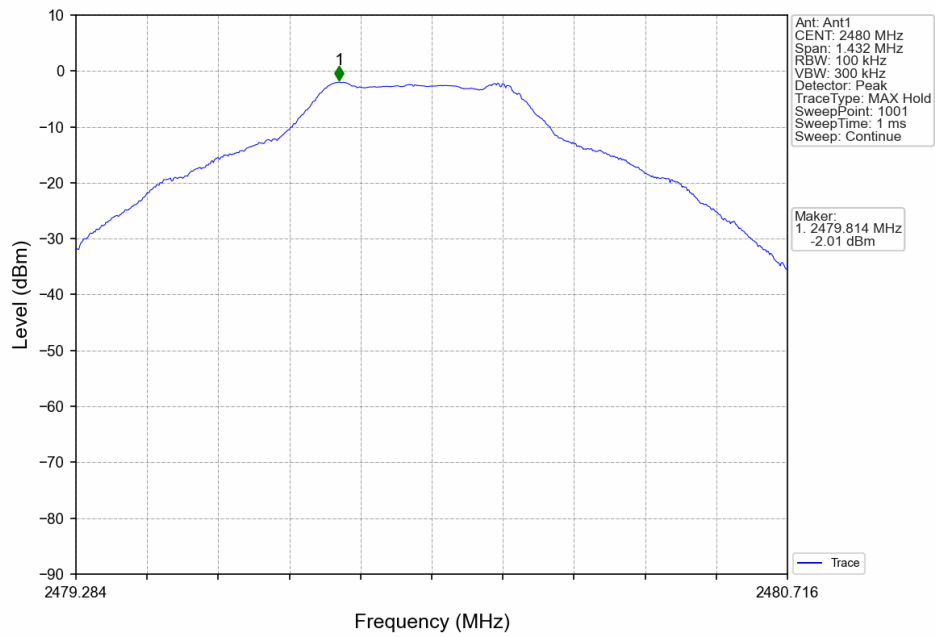
| Mode      | TX Type | Frequency (MHz) | Packet Type | ANT | Level of Reference (dBm) |
|-----------|---------|-----------------|-------------|-----|--------------------------|
| GFSK      | SISO    | 2402            | DH5         | 1   | -2.52                    |
|           |         | 2441            | DH5         | 1   | -1.72                    |
|           |         | 2480            | DH5         | 1   | -2.01                    |
| Pi/4DQPSK | SISO    | 2402            | 2DH5        | 1   | -2.55                    |
|           |         | 2441            | 2DH5        | 1   | -1.75                    |
|           |         | 2480            | 2DH5        | 1   | -2.01                    |
| 8DPSK     | SISO    | 2402            | 3DH5        | 1   | -2.52                    |
|           |         | 2441            | 3DH5        | 1   | -1.71                    |
|           |         | 2480            | 3DH5        | 1   | -1.98                    |

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.

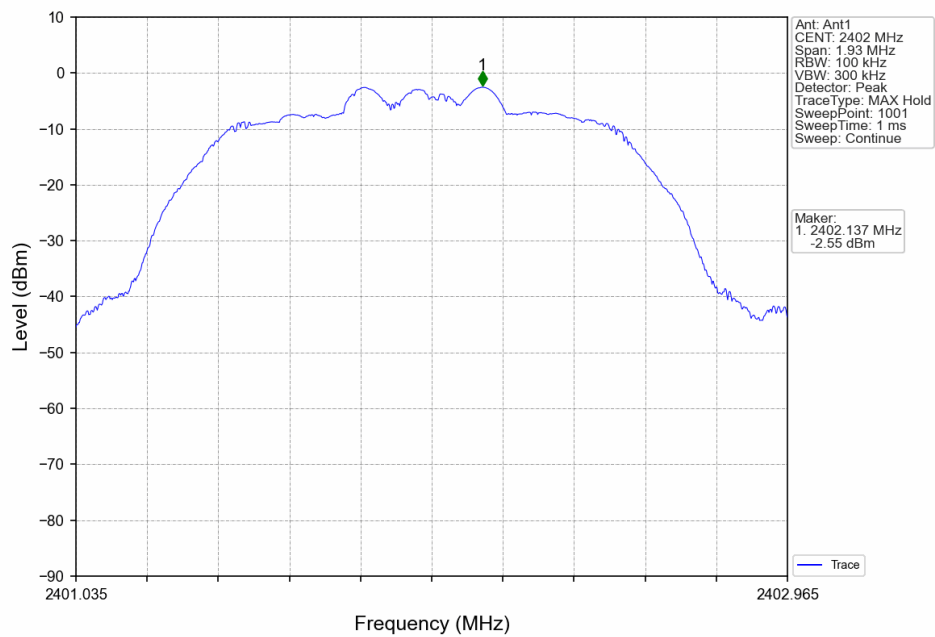
## 6.1.2 Test Graph



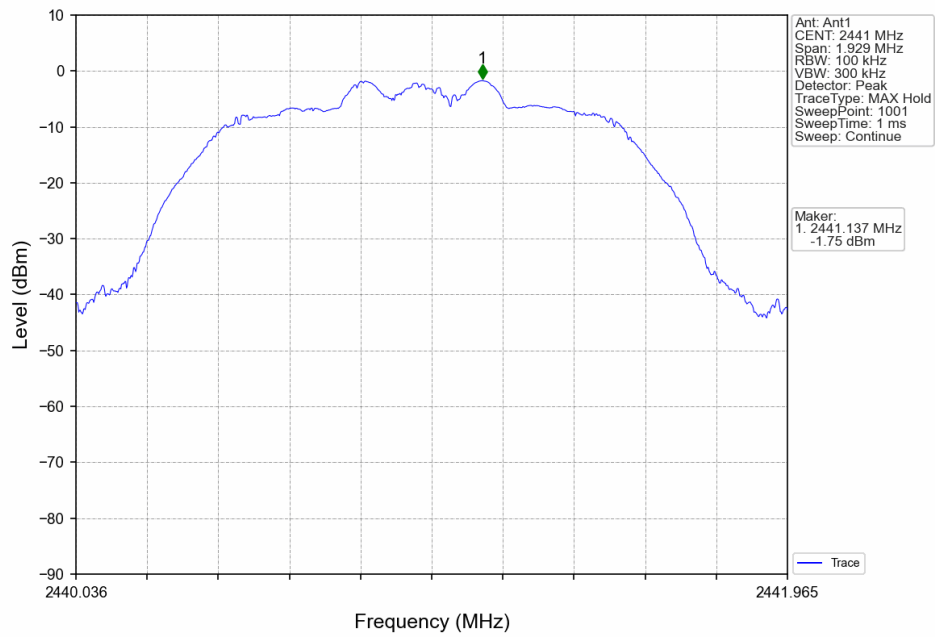
GFSK DH5 HCH 2480MHz Ant1 NTNV



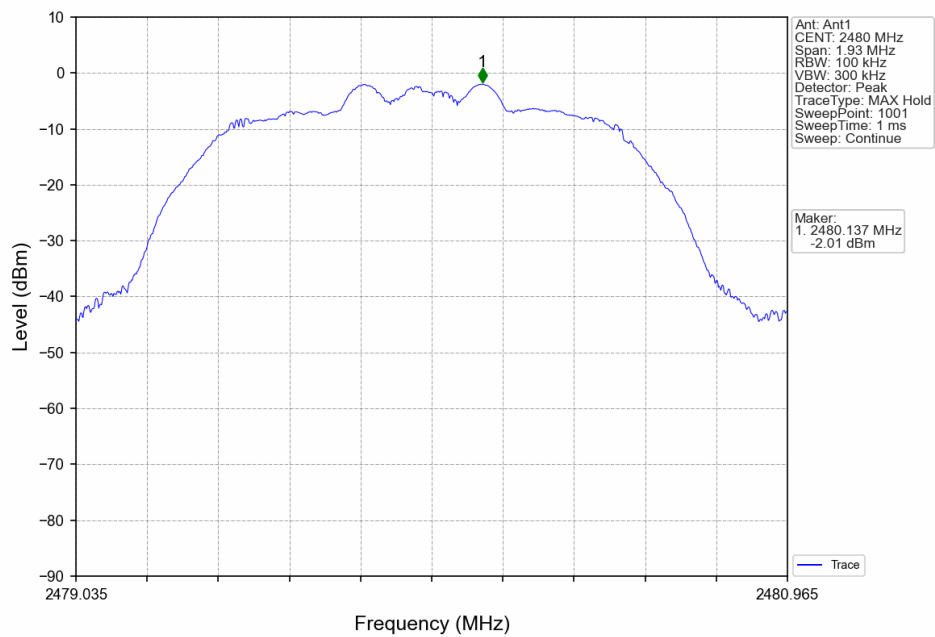
Pi/4DQPSK 2DH5 LCH 2402MHz Ant1 NTNV



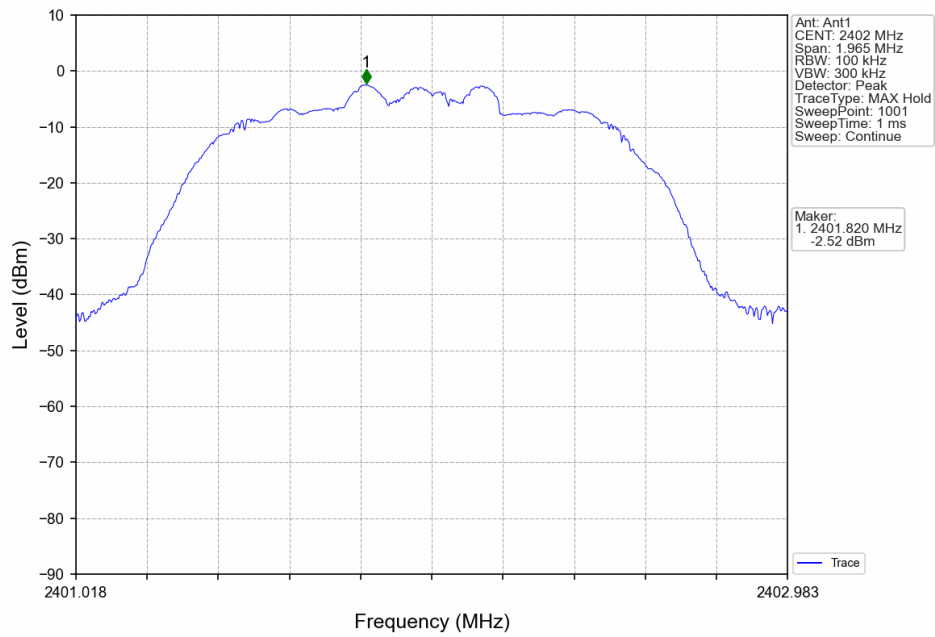
Pi/4DQPSK 2DH5 MCH 2441MHz Ant1 NTN



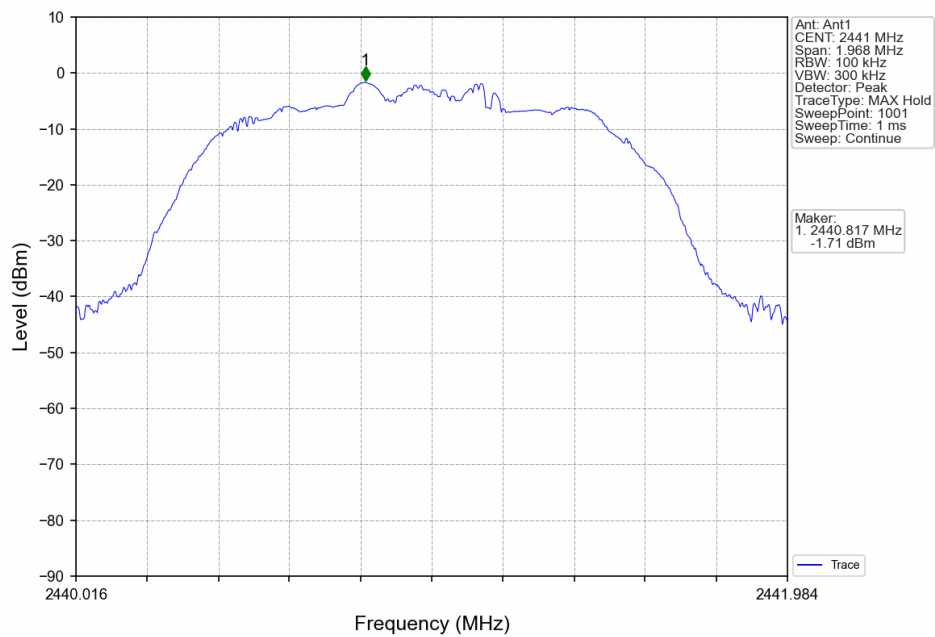
Pi/4DQPSK 2DH5 HCH 2480MHz Ant1 NTN

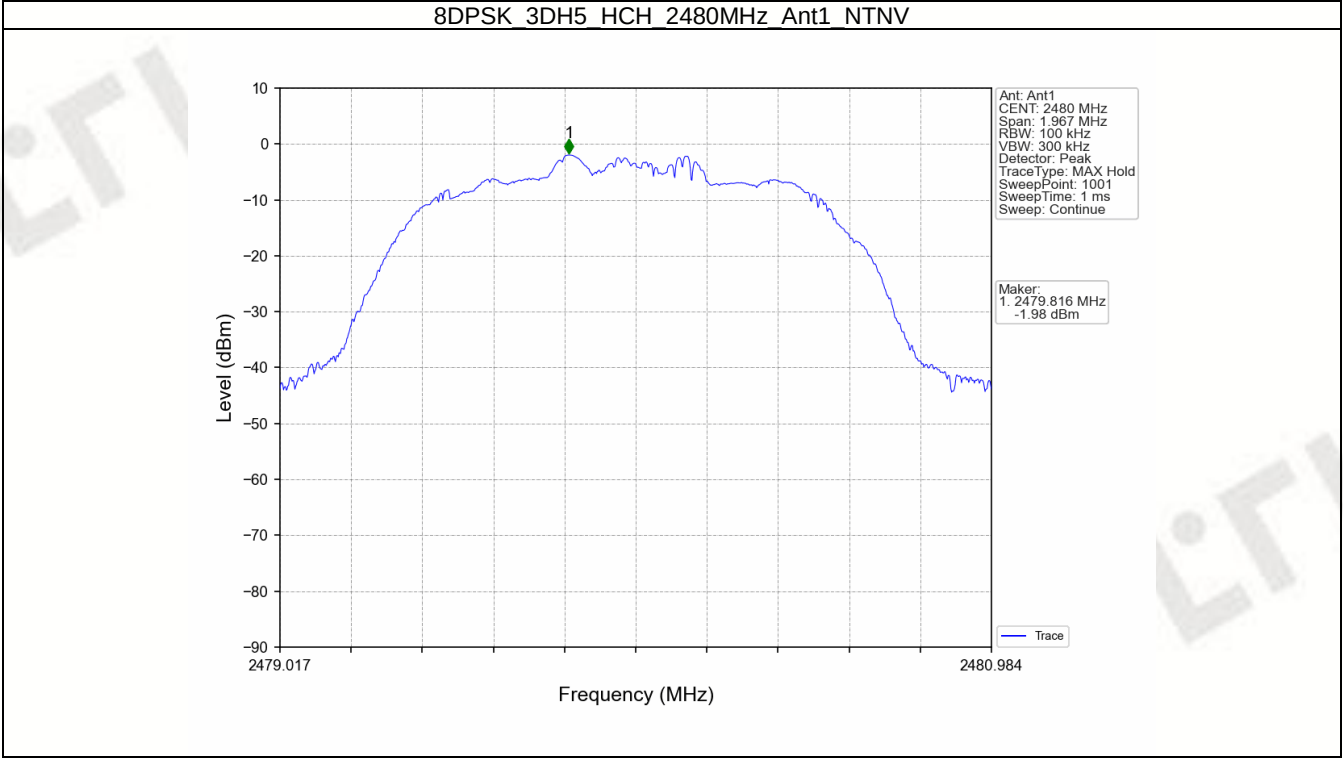


8DPSK 3DH5 LCH 2402MHz Ant1 NTV



8DPSK 3DH5 MCH 2441MHz Ant1 NTV



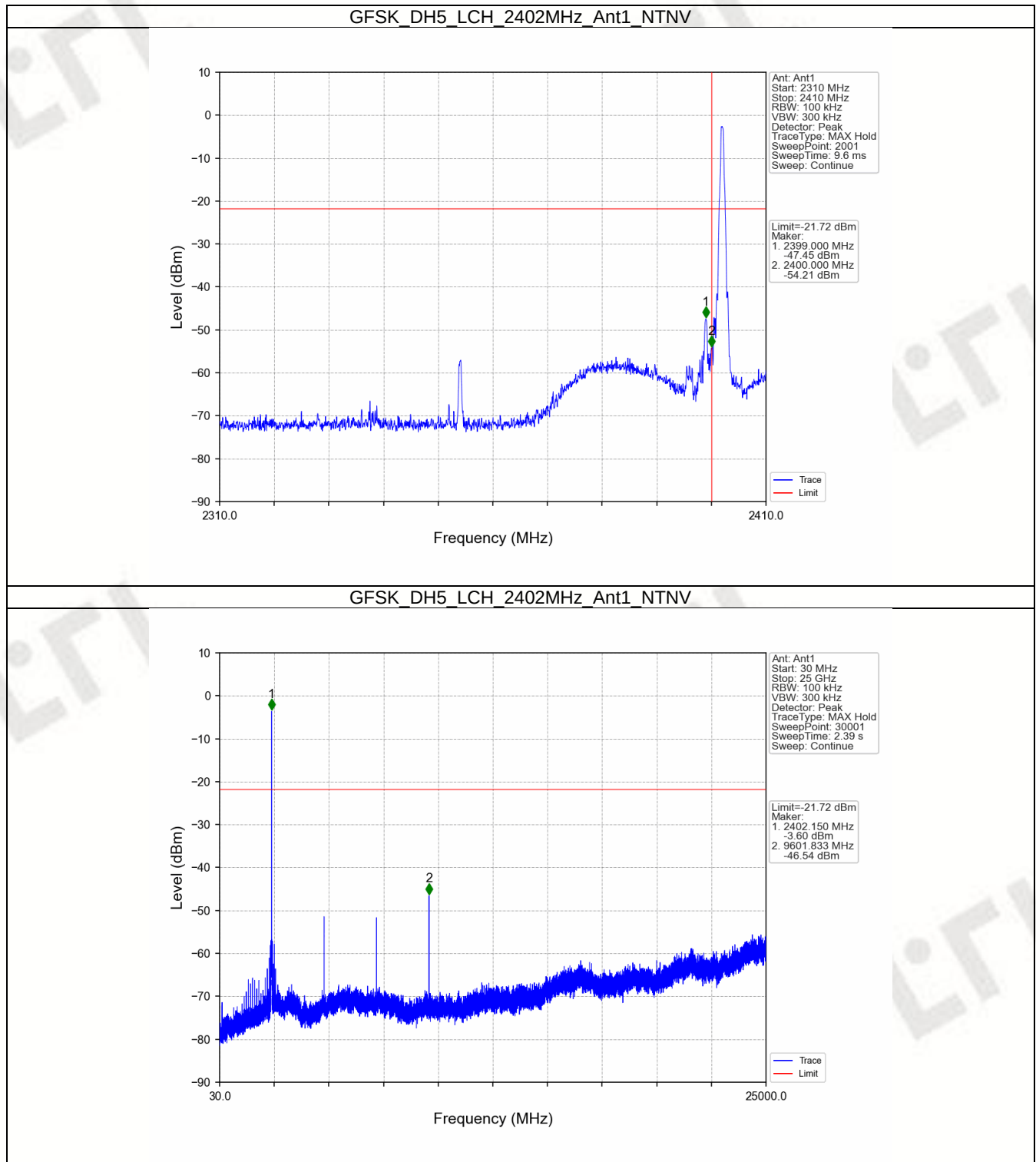


### 6.2.1 Test Result

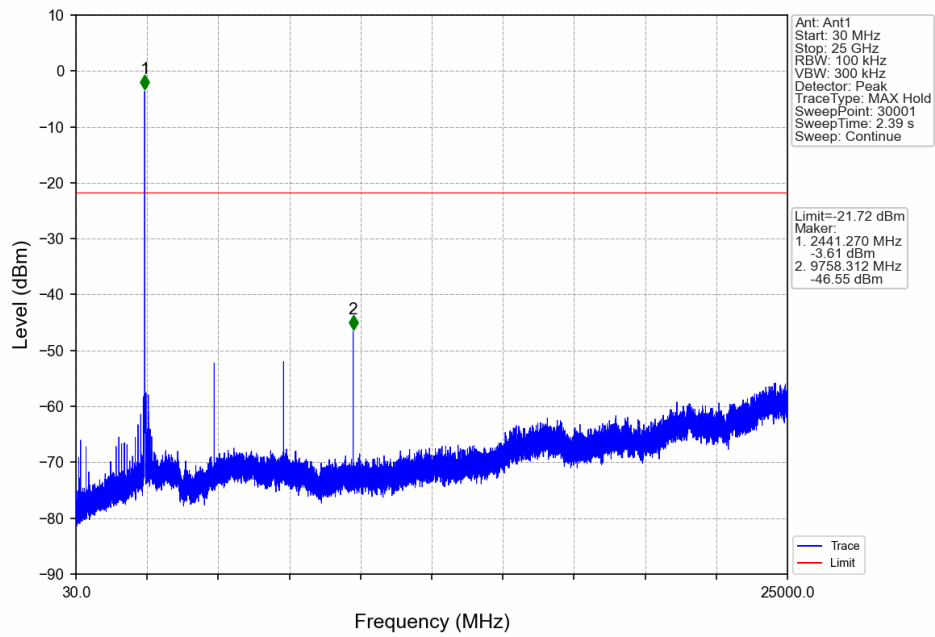
| Mode      | TX Type | Frequency (MHz) | Packet Type | ANT | Level of Reference (dBm) | Limit (dBm) | Verdict |
|-----------|---------|-----------------|-------------|-----|--------------------------|-------------|---------|
| GFSK      | SISO    | 2402            | DH5         | 1   | -1.72                    | -21.72      | Pass    |
|           |         | 2441            | DH5         | 1   | -1.72                    | -21.72      | Pass    |
|           |         | 2480            | DH5         | 1   | -1.72                    | -21.72      | Pass    |
|           |         | HOPP            | DH5         | 1   | -1.72                    | -21.72      | Pass    |
|           |         |                 |             |     | -1.72                    | -21.72      | Pass    |
| Pi/4DQPSK | SISO    | 2402            | 2DH5        | 1   | -1.75                    | -21.75      | Pass    |
|           |         | 2441            | 2DH5        | 1   | -1.75                    | -21.75      | Pass    |
|           |         | 2480            | 2DH5        | 1   | -1.75                    | -21.75      | Pass    |
|           |         | HOPP            | 2DH5        | 1   | -1.75                    | -21.75      | Pass    |
|           |         |                 |             |     | -1.75                    | -21.75      | Pass    |
| 8DPSK     | SISO    | 2402            | 3DH5        | 1   | -1.71                    | -21.71      | Pass    |
|           |         | 2441            | 3DH5        | 1   | -1.71                    | -21.71      | Pass    |
|           |         | 2480            | 3DH5        | 1   | -1.71                    | -21.71      | Pass    |
|           |         | HOPP            | 3DH5        | 1   | -1.71                    | -21.71      | Pass    |
|           |         |                 |             |     | -1.71                    | -21.71      | 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.

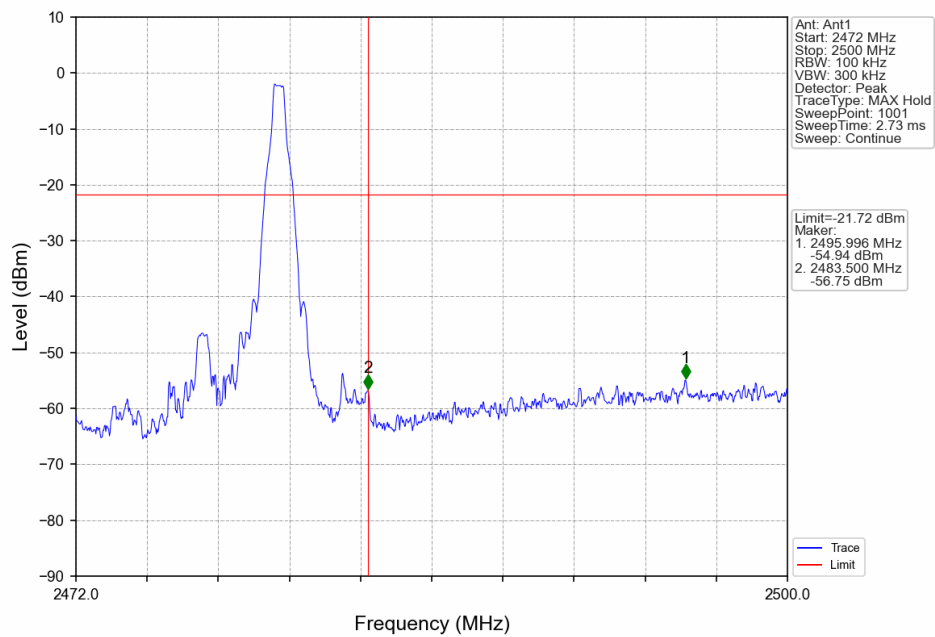
## 6.2.2 Test Graph



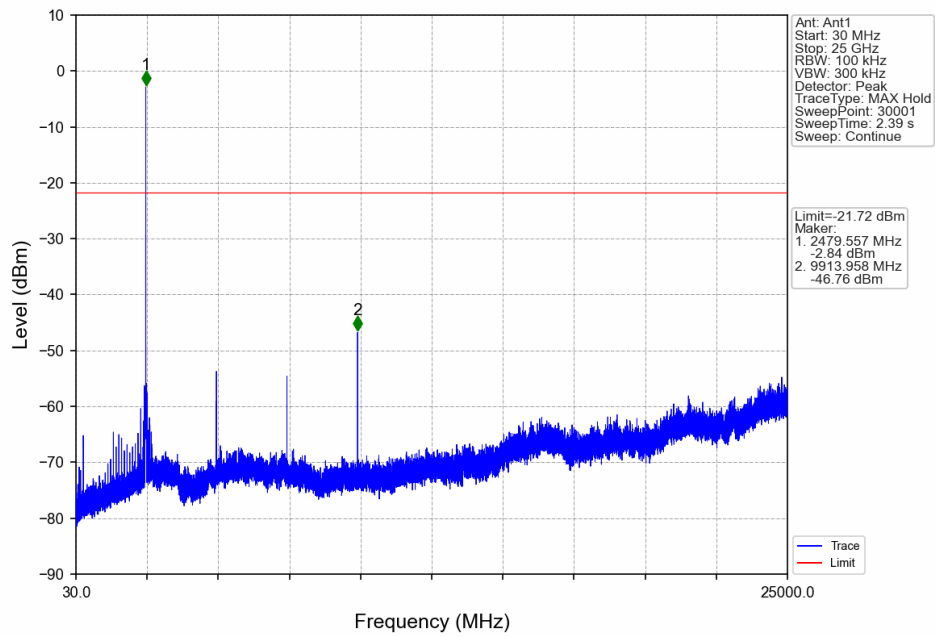
## GFSK DH5 MCH 2441MHz Ant1 NTN



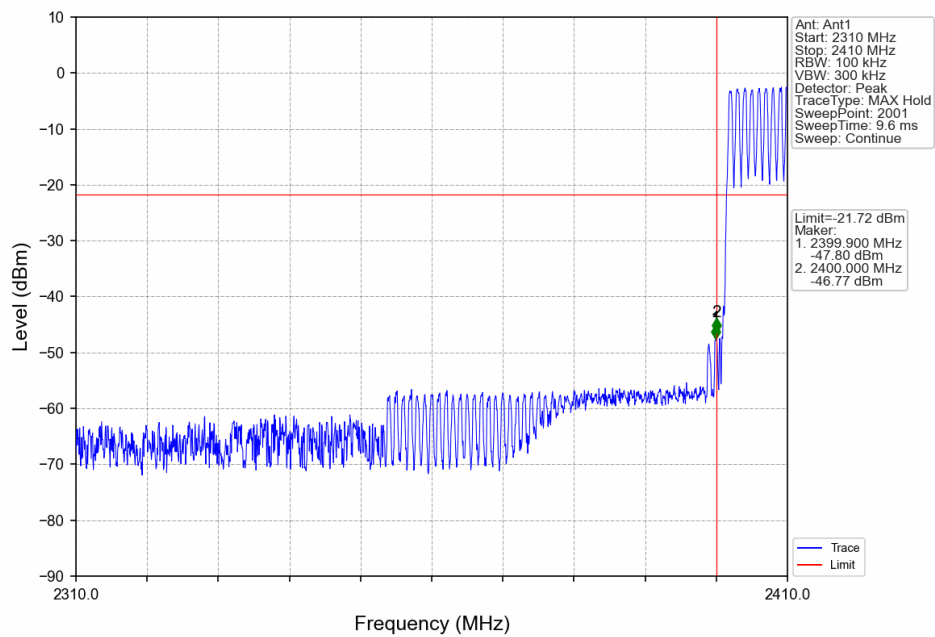
## GFSK DH5 HCH 2480MHz Ant1 NTN



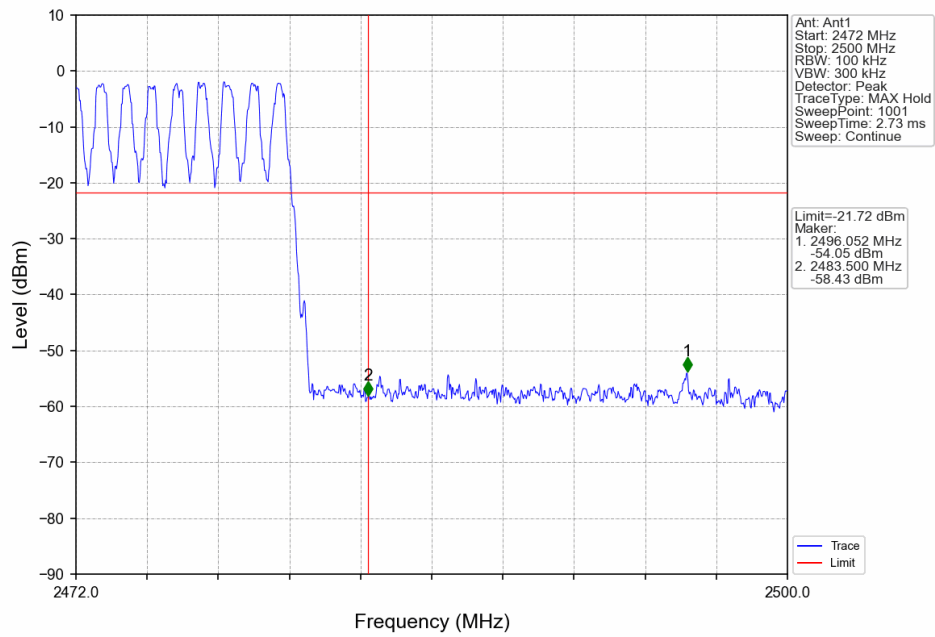
## GFSK DH5 HCH 2480MHz Ant1 NTV



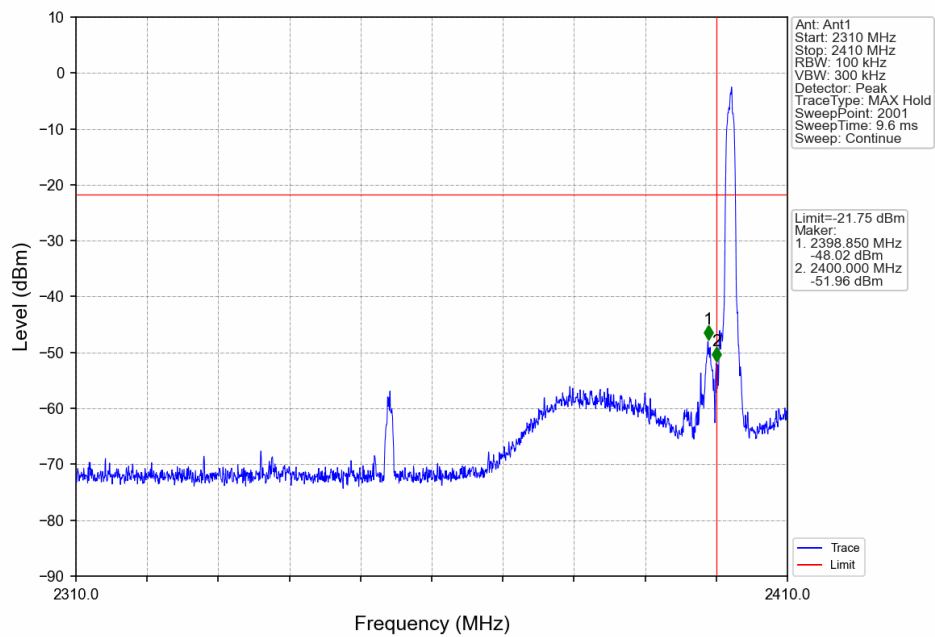
## GFSK DH5 HOPP Ant1 NTV



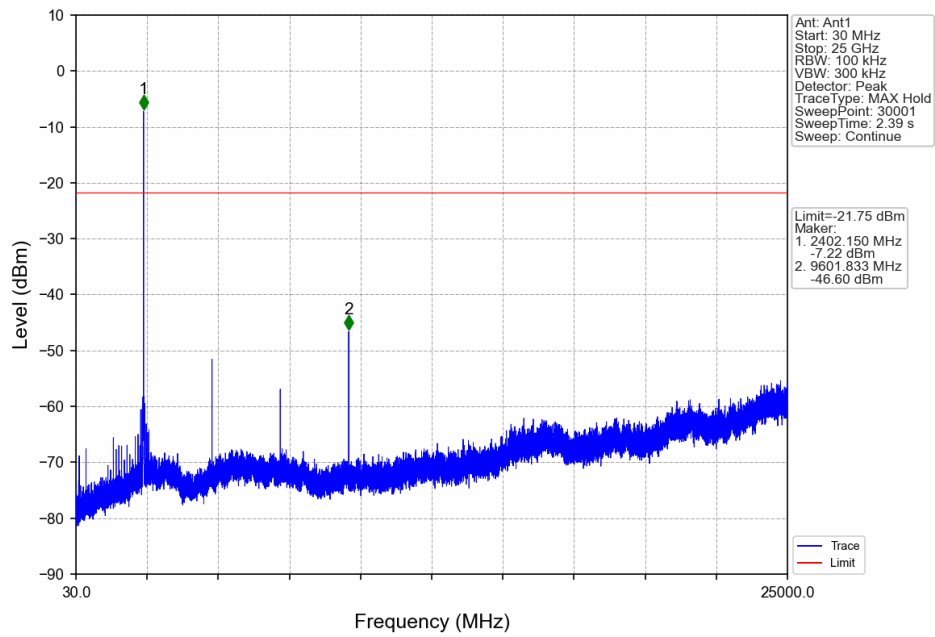
## GFSK DH5 HOPP Ant1 NTN



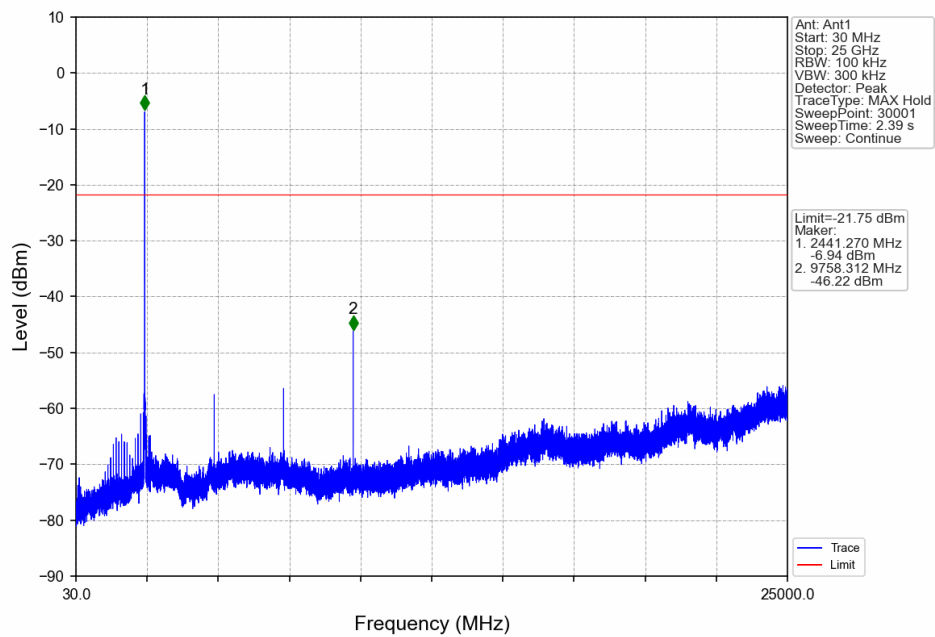
## Pi/4DQPSK 2DH5 LCH 2402MHz Ant1 NTN



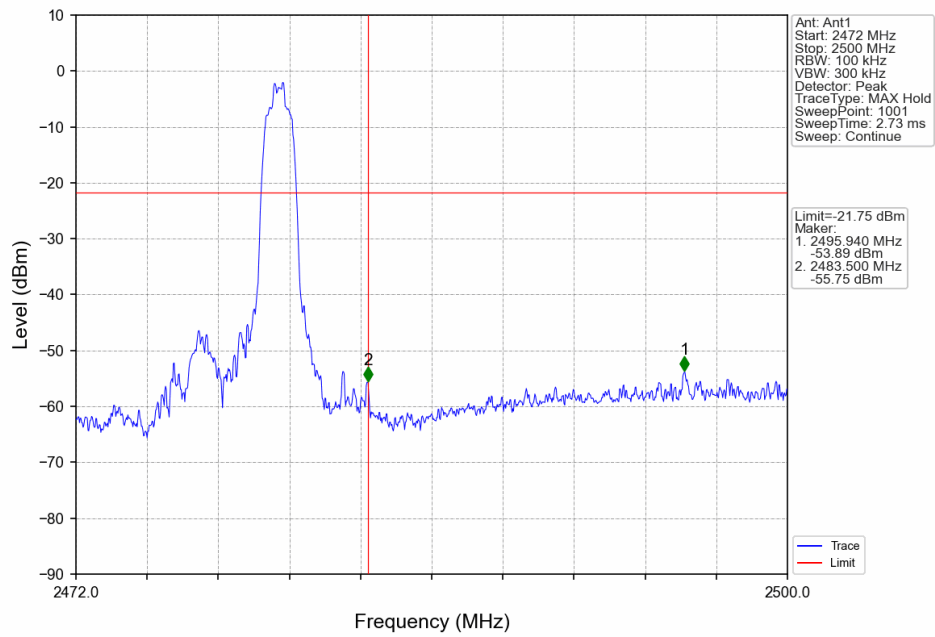
Pi/4DQPSK 2DH5 LCH 2402MHz Ant1 NTN



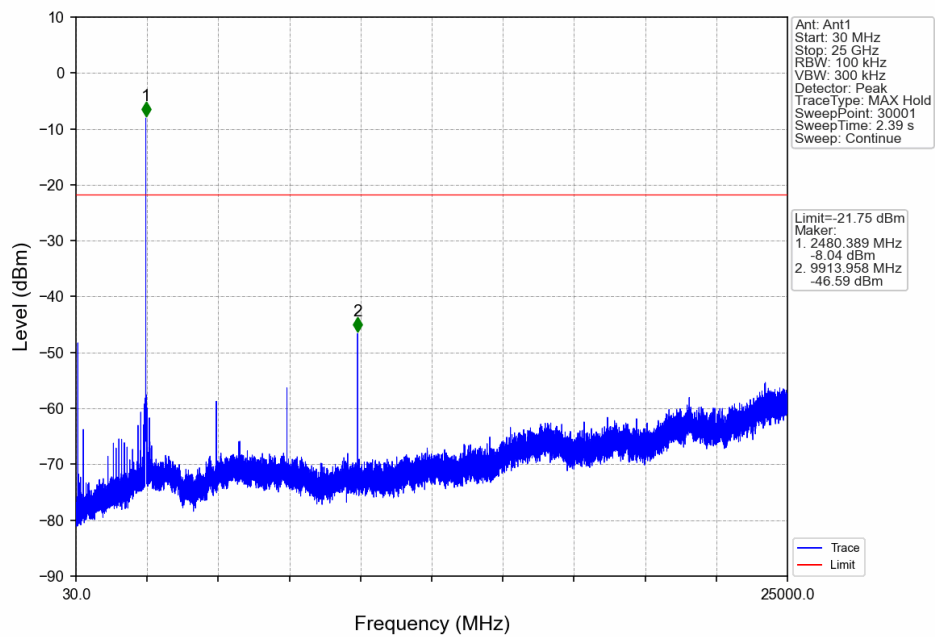
Pi/4DQPSK 2DH5 MCH 2441MHz Ant1 NTN



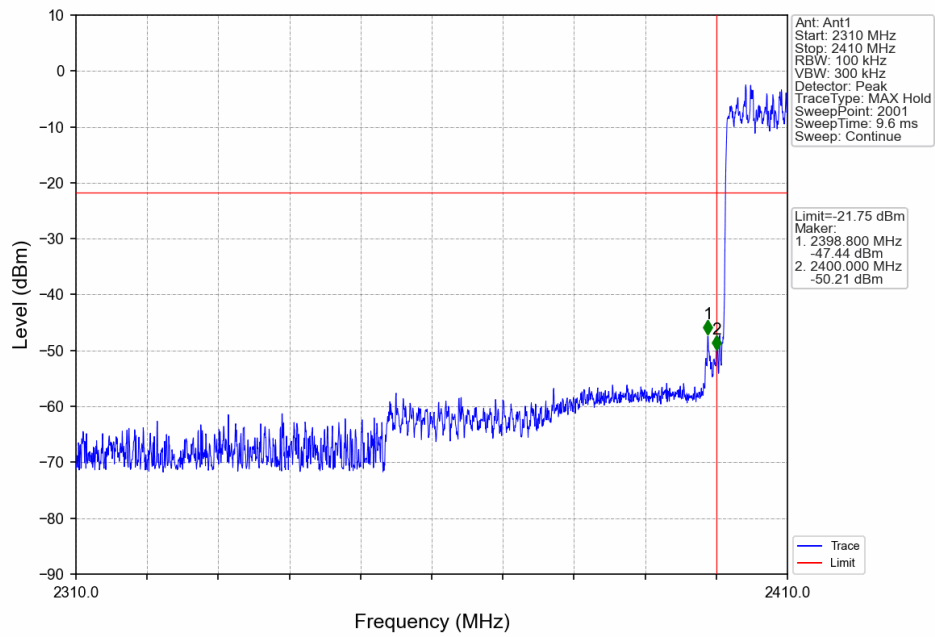
Pi/4DQPSK 2DH5 HCH 2480MHz Ant1 NTN



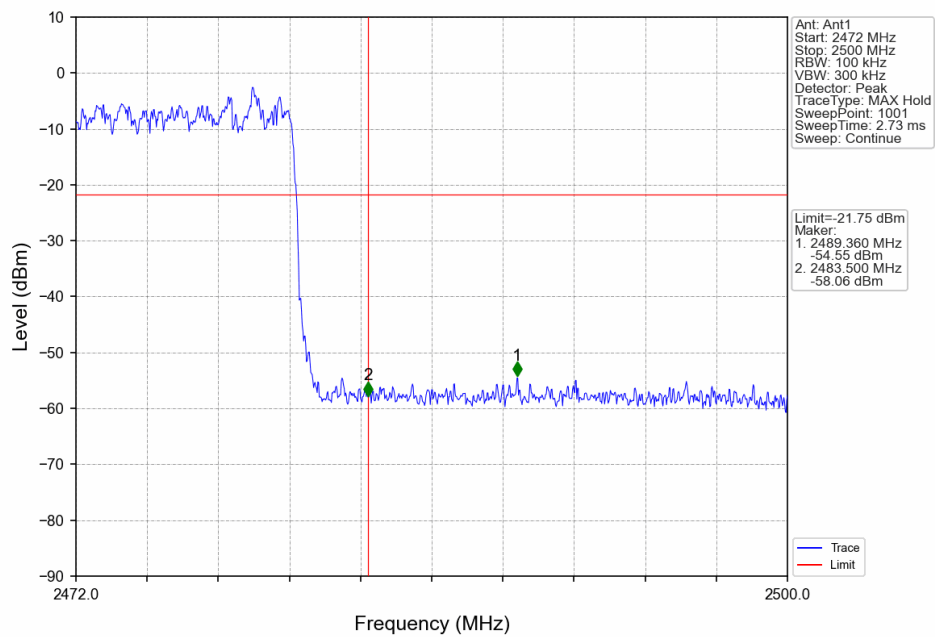
Pi/4DQPSK 2DH5 HCH 2480MHz Ant1 NTN



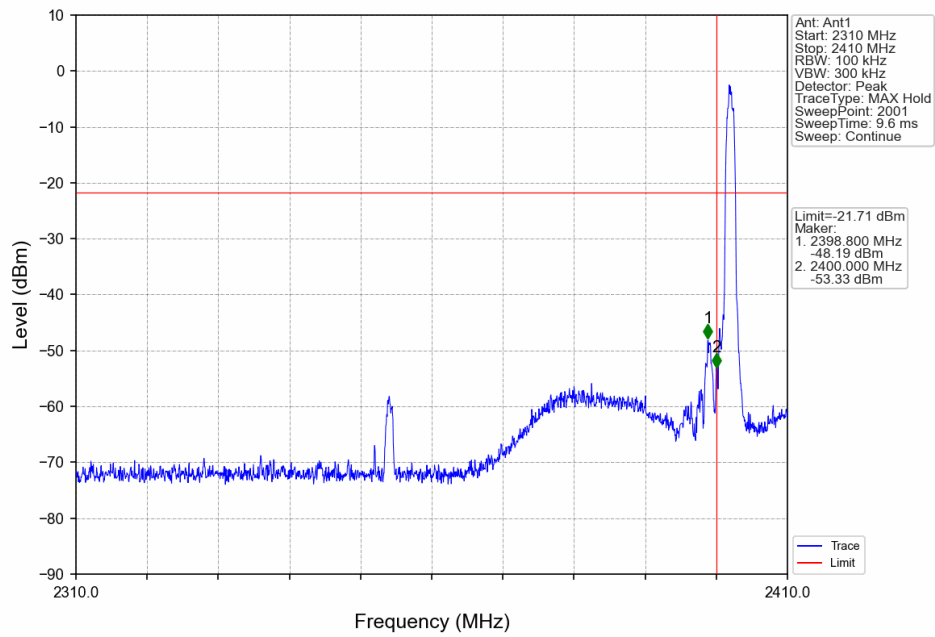
Pi/4DQPSK 2DH5 HOPP Ant1 NTNV



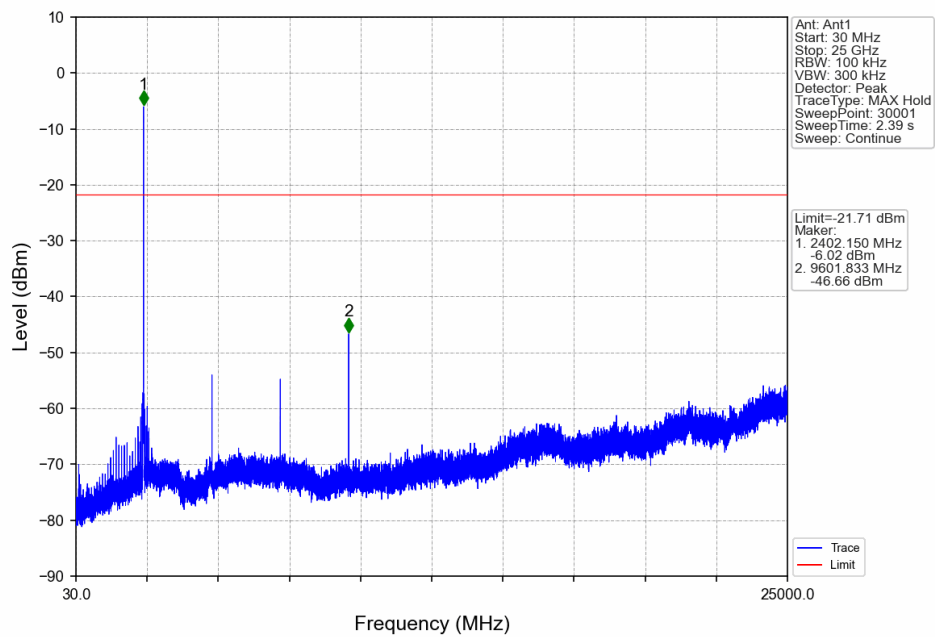
Pi/4DQPSK 2DH5 HOPP Ant1 NTNV



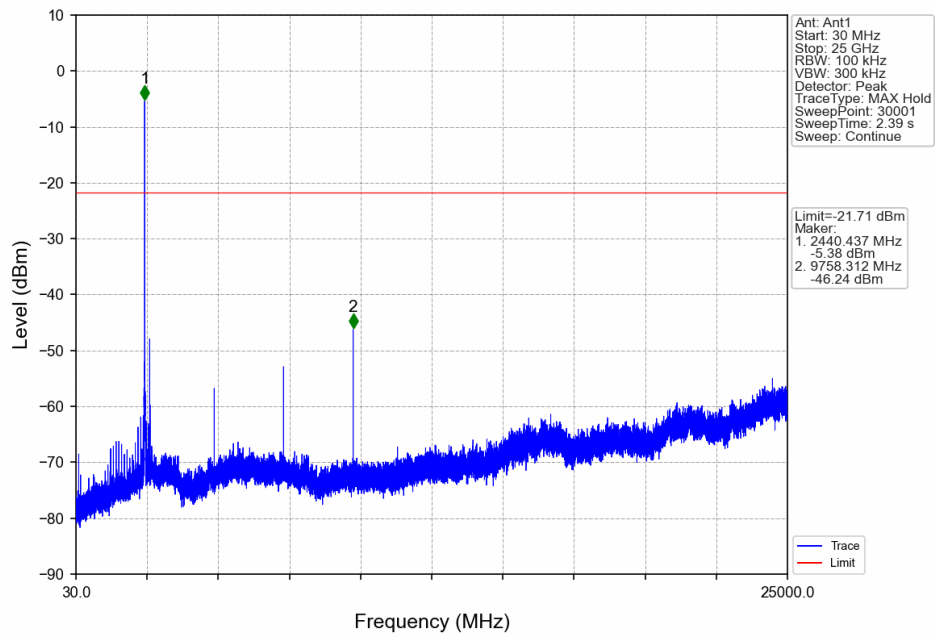
## 8DPSK 3DH5 LCH 2402MHz Ant1 NTNV



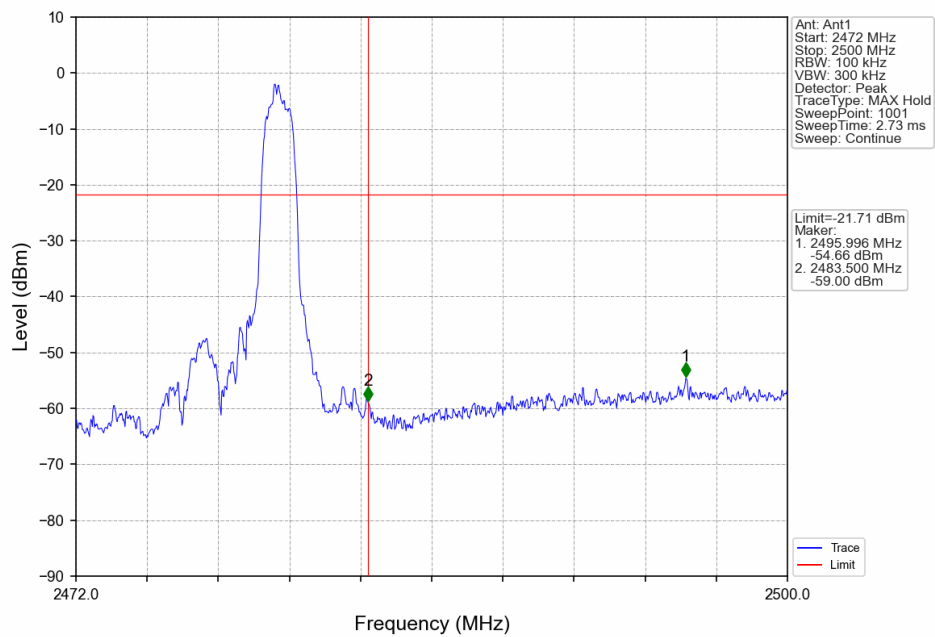
## 8DPSK 3DH5 LCH 2402MHz Ant1 NTNV



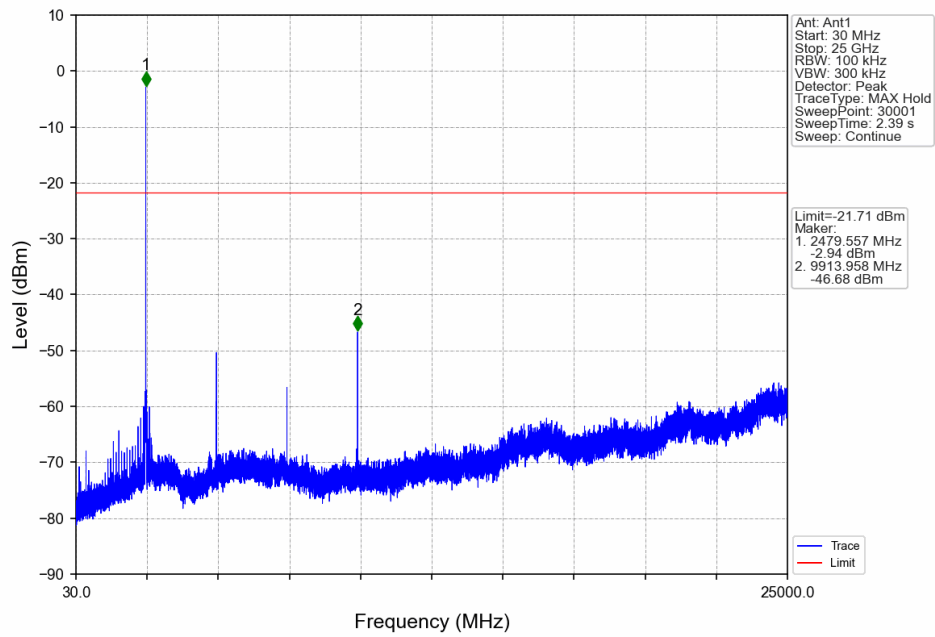
## 8DPSK 3DH5 MCH 2441MHz Ant1 NTN



## 8DPSK 3DH5 HCH 2480MHz Ant1 NTN



## 8DPSK 3DH5 HCH 2480MHz Ant1 NTN



## 8DPSK 3DH5 HOPP Ant1 NTN

