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## Annex for Bluetooth

Test Report No.: CTL2606182011-WF

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FCC ID: 2APOQ-T104A

## 1. Bandwidth

### 1.1 Test Result

#### 1.1.1 OBW

| Mode      | TX Type | Frequency (MHz) | Packet Type | ANT | 99% Occupied Bandwidth (MHz) |       | Verdict |
|-----------|---------|-----------------|-------------|-----|------------------------------|-------|---------|
|           |         |                 |             |     | Result                       | Limit |         |
| GFSK      | SISO    | 2402            | DH5         | 1   | 0.833                        | /     | Pass    |
|           |         | 2441            | DH5         | 1   | 0.822                        | /     | Pass    |
|           |         | 2480            | DH5         | 1   | 0.819                        | /     | Pass    |
| Pi/4DQPSK | SISO    | 2402            | 2DH5        | 1   | 1.169                        | /     | Pass    |
|           |         | 2441            | 2DH5        | 1   | 1.173                        | /     | Pass    |
|           |         | 2480            | 2DH5        | 1   | 1.169                        | /     | Pass    |
| 8DPSK     | SISO    | 2402            | 3DH5        | 1   | 1.187                        | /     | Pass    |
|           |         | 2441            | 3DH5        | 1   | 1.185                        | /     | Pass    |
|           |         | 2480            | 3DH5        | 1   | 1.181                        | /     | Pass    |

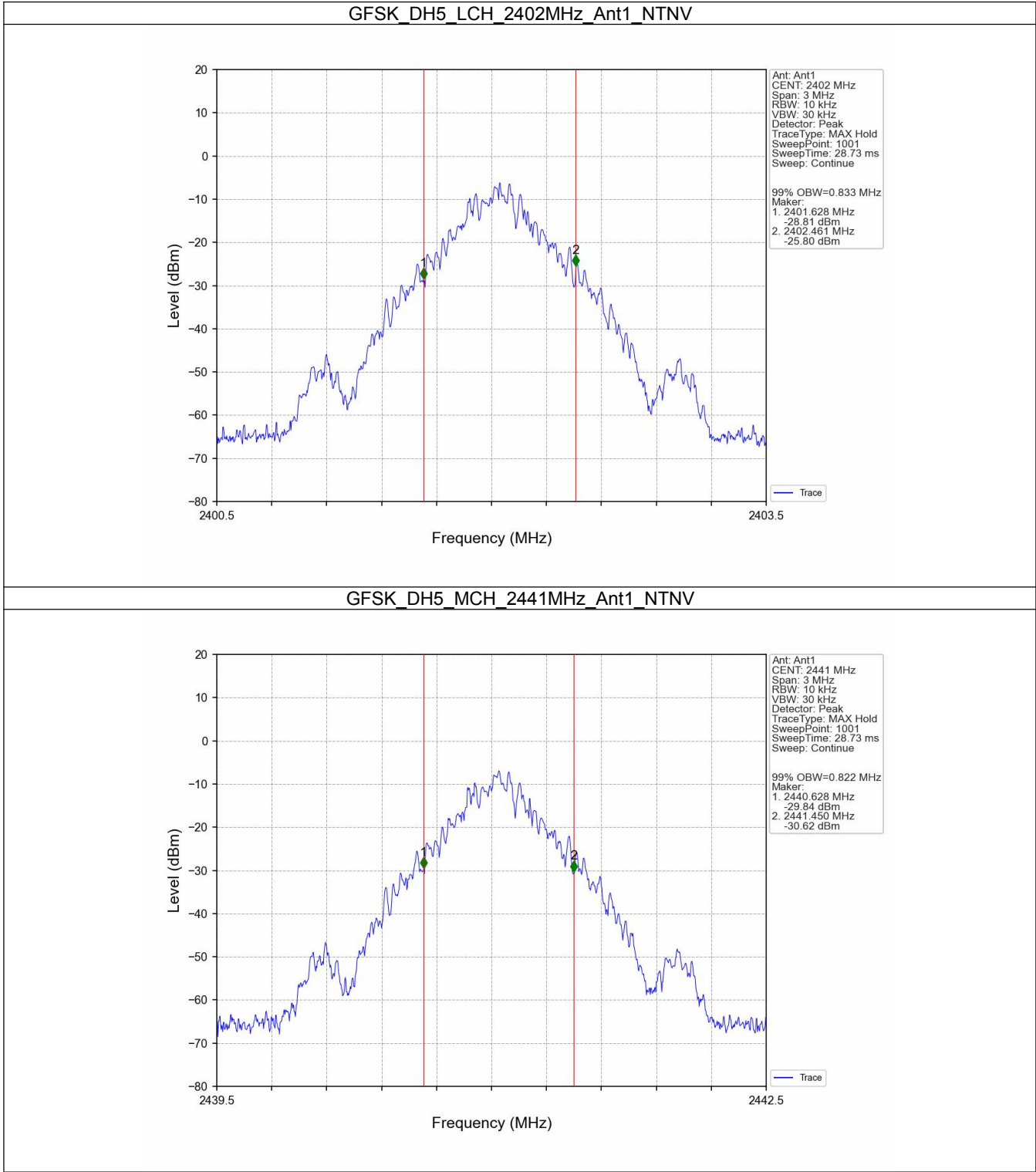
#### 1.1.2 20dB BW

| Mode      | TX Type | Frequency (MHz) | Packet Type | ANT | 20dB Bandwidth (MHz) |       | Verdict |
|-----------|---------|-----------------|-------------|-----|----------------------|-------|---------|
|           |         |                 |             |     | Result               | Limit |         |
| GFSK      | SISO    | 2402            | DH5         | 1   | 0.918                | /     | Pass    |
|           |         | 2441            | DH5         | 1   | 0.883                | /     | Pass    |
|           |         | 2480            | DH5         | 1   | 0.883                | /     | Pass    |
| Pi/4DQPSK | SISO    | 2402            | 2DH5        | 1   | 1.254                | /     | Pass    |
|           |         | 2441            | 2DH5        | 1   | 1.241                | /     | Pass    |
|           |         | 2480            | 2DH5        | 1   | 1.233                | /     | Pass    |
| 8DPSK     | SISO    | 2402            | 3DH5        | 1   | 1.289                | /     | Pass    |
|           |         | 2441            | 3DH5        | 1   | 1.286                | /     | Pass    |
|           |         | 2480            | 3DH5        | 1   | 1.285                | /     | Pass    |

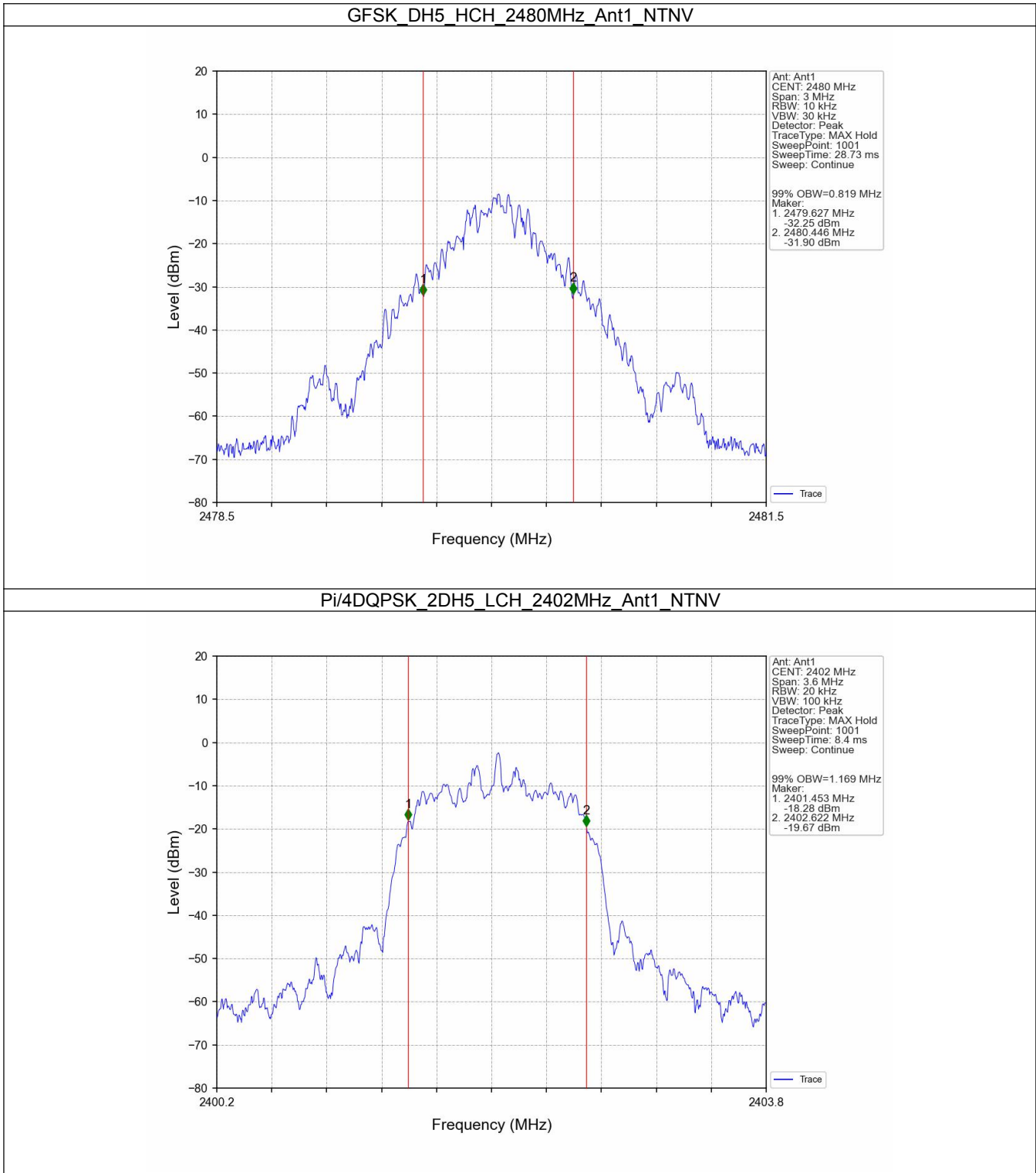
FCC ID: 2APOQ-T104A

1.2 Test Graph

1.2.1 OBW

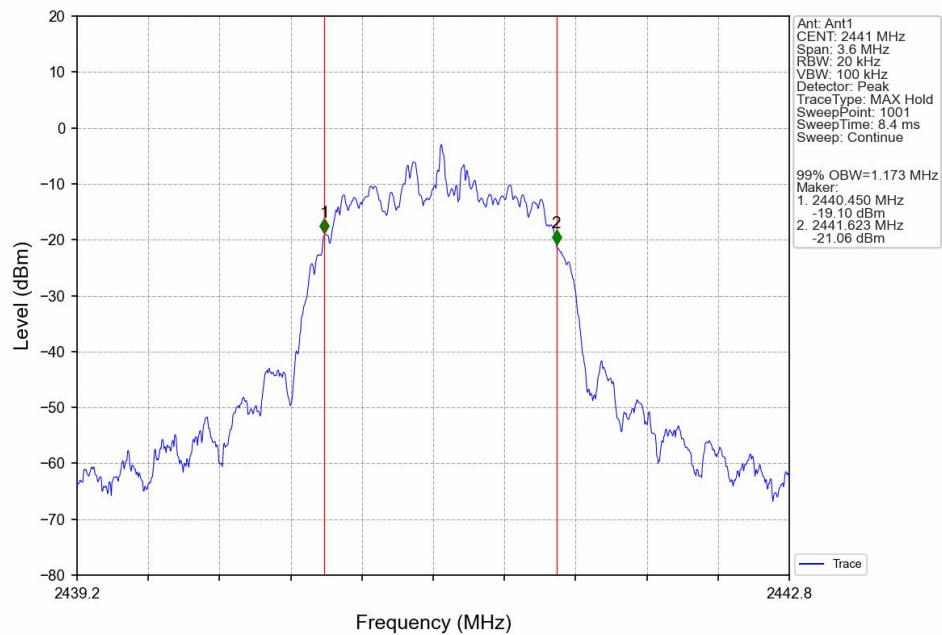


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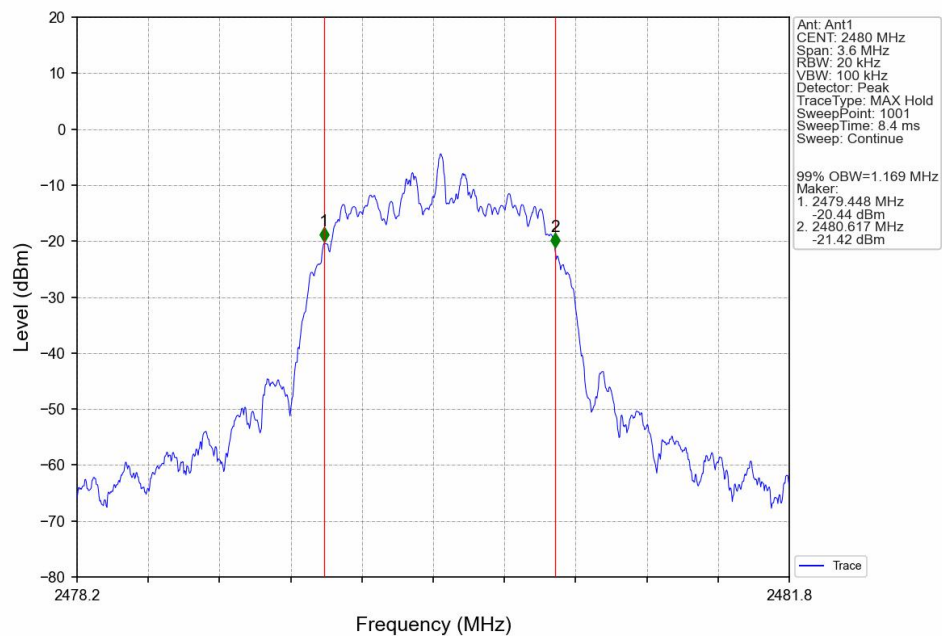


FCC ID: 2APOQ-T104A

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

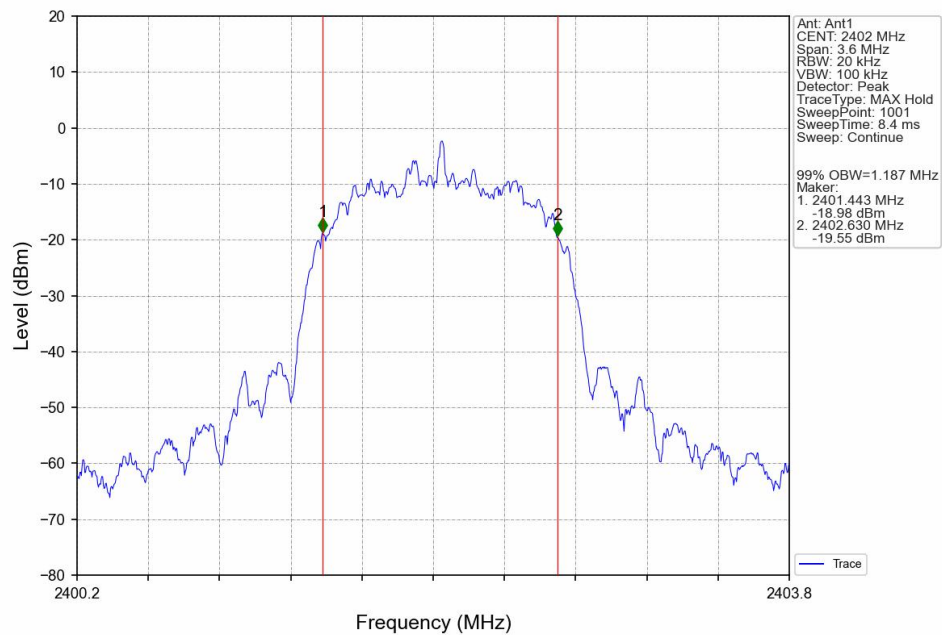


Pi/4DQPSK\_2DH5\_HCH\_2480MHz\_Ant1\_NTNV

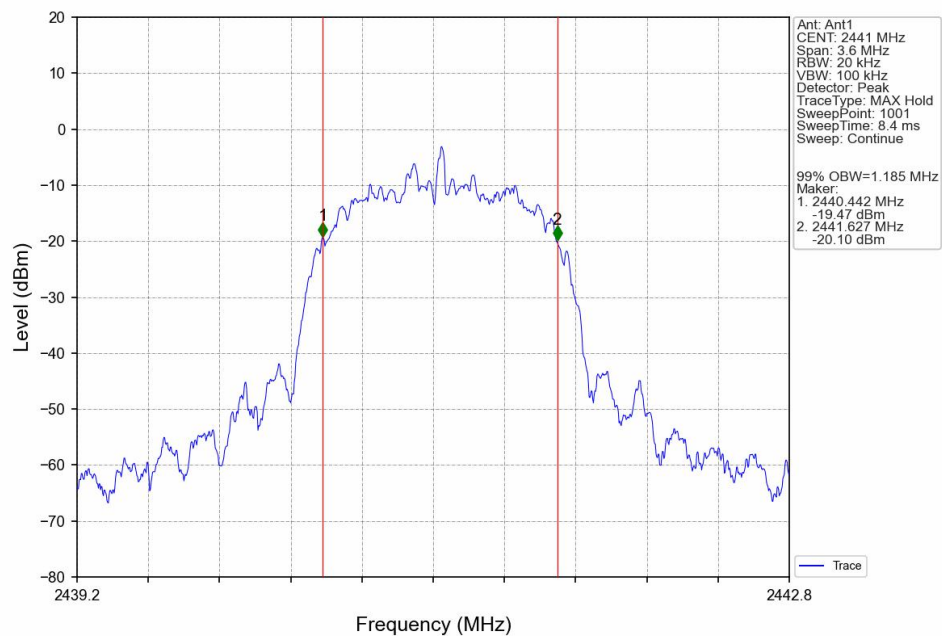


FCC ID: 2APOQ-T104A

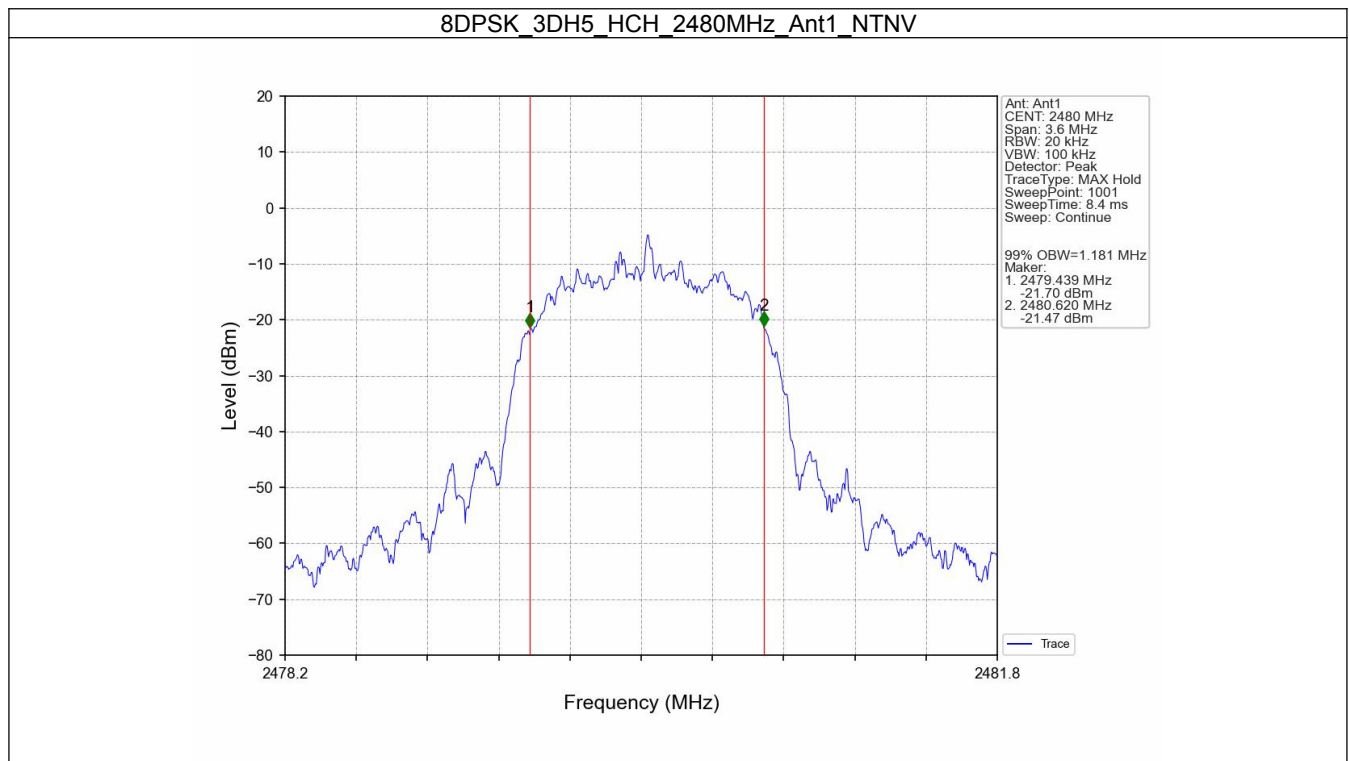
8DPSK\_3DH5\_LCH\_2402MHz\_Ant1\_NTNV



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

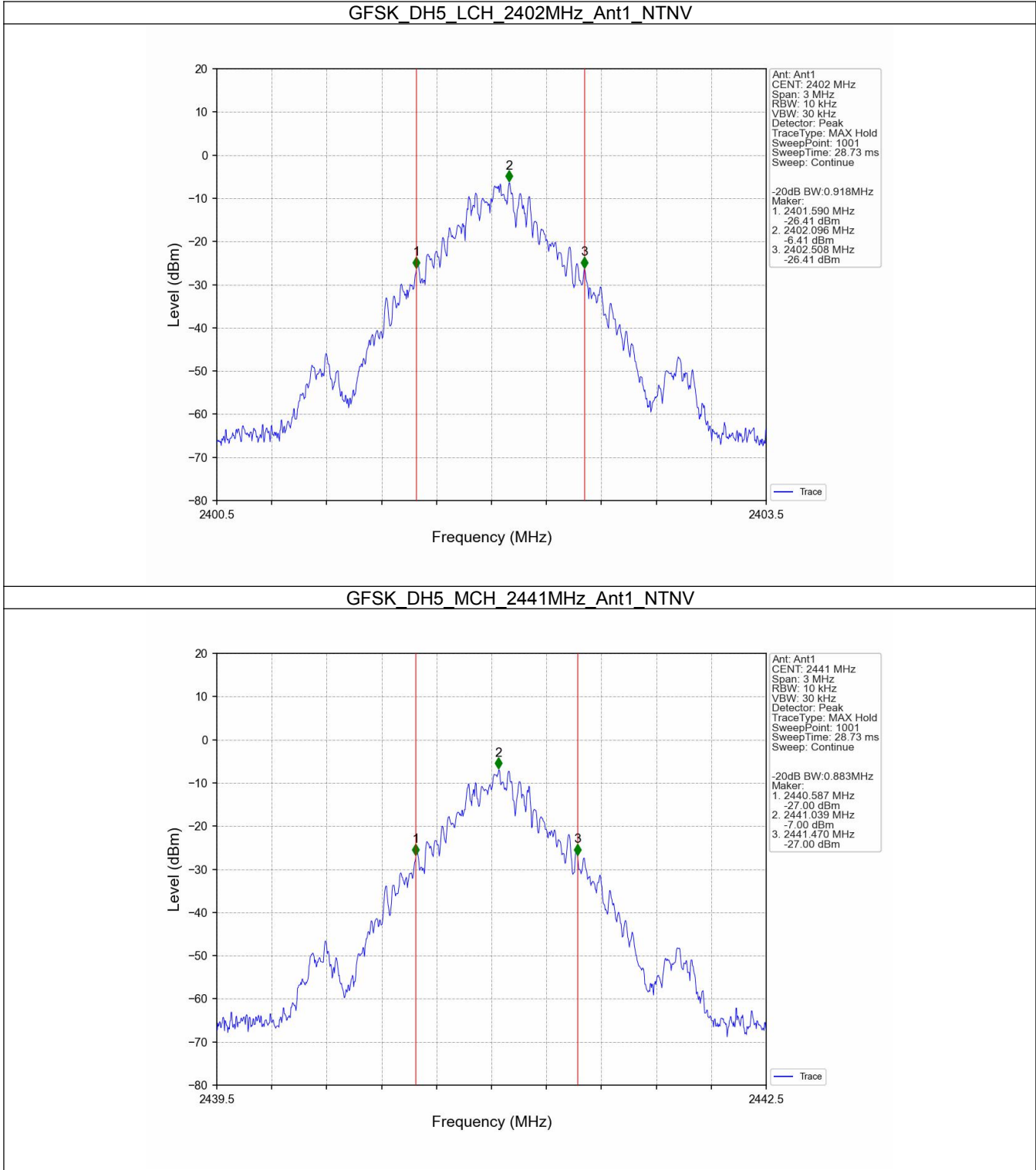


FCC ID: 2APOQ-T104A



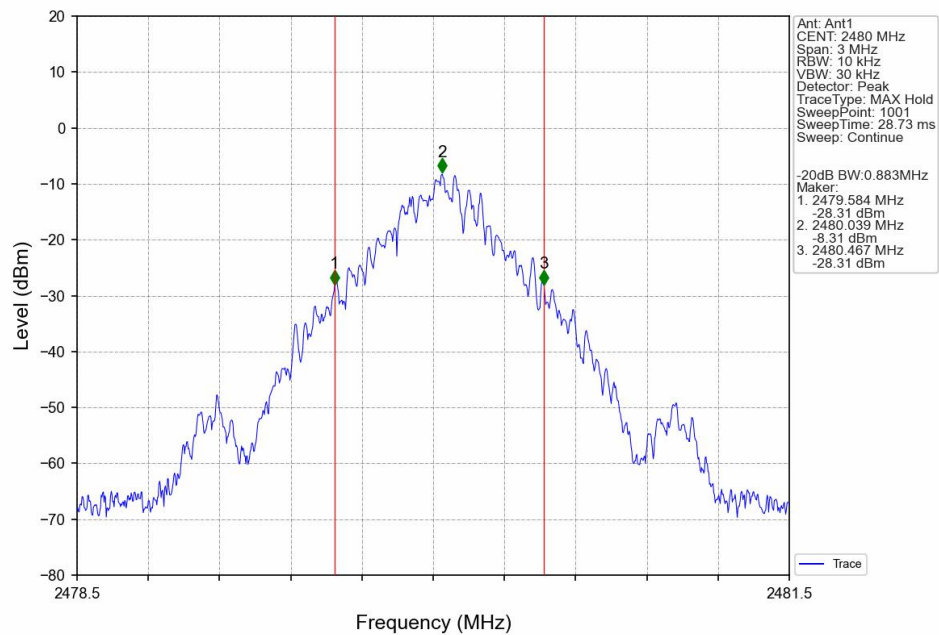
FCC ID: 2APOQ-T104A

1.2.2 20dB BW

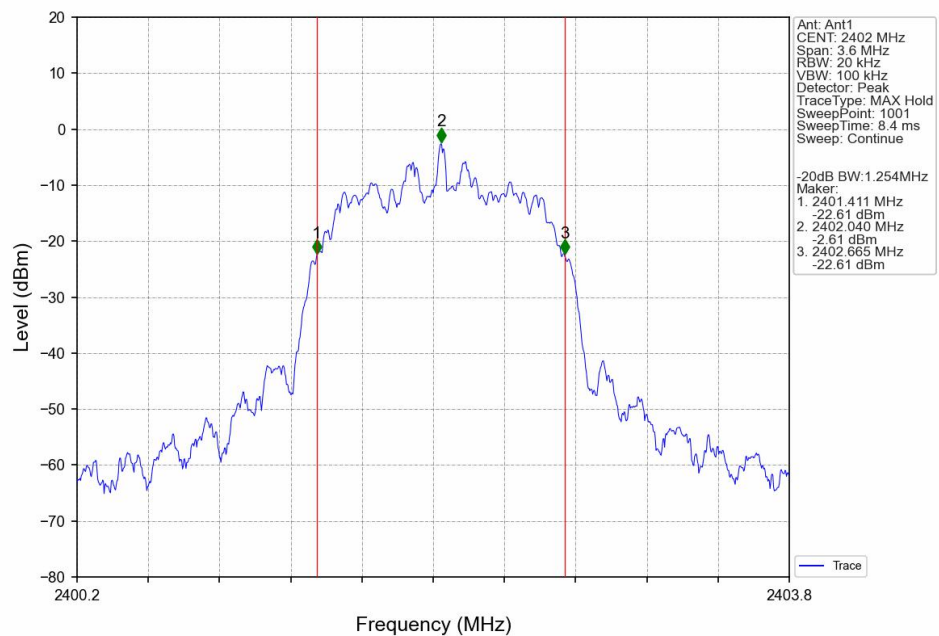


FCC ID: 2APOQ-T104A

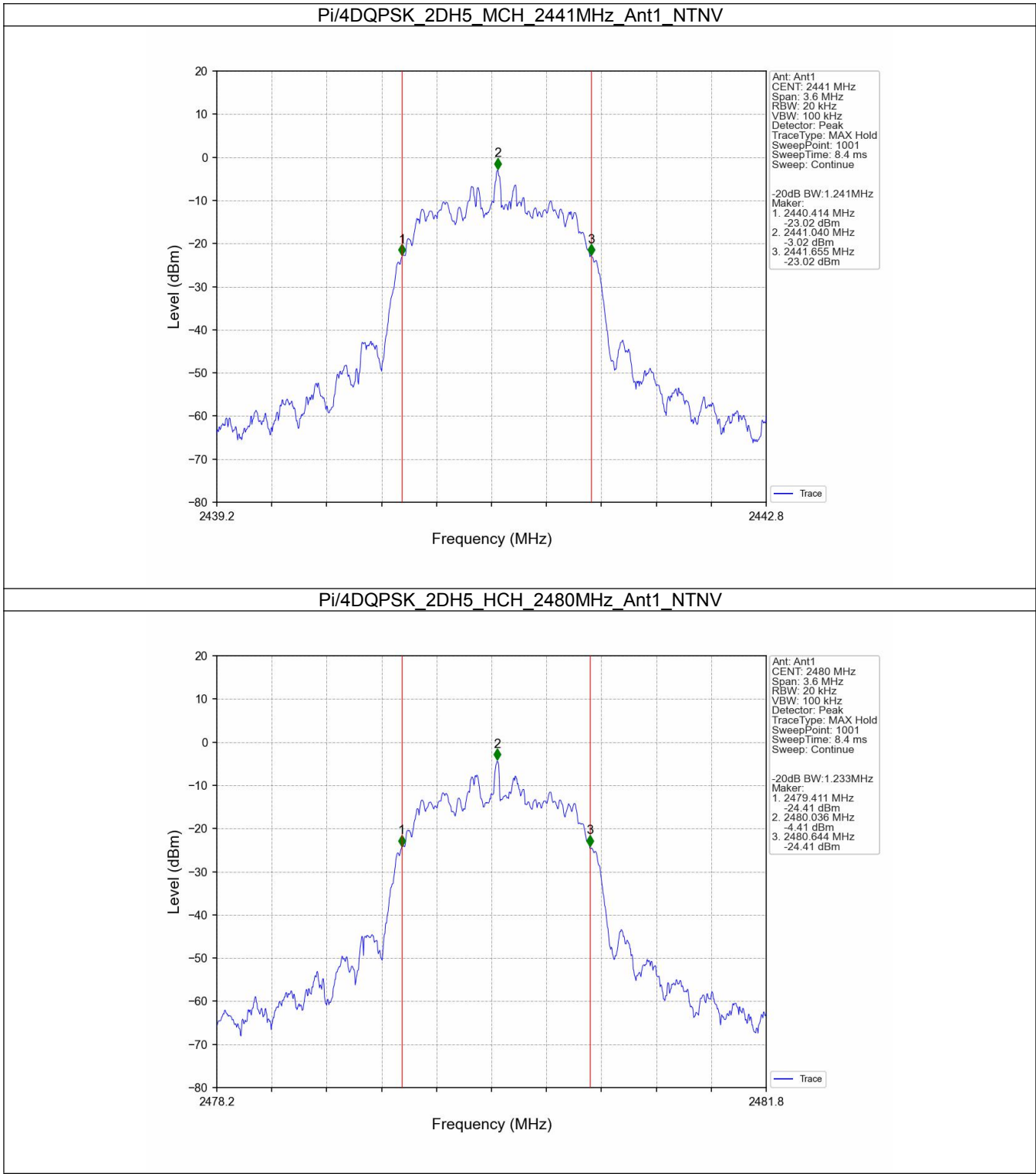
GFSK\_DH5\_HCH\_2480MHz\_Ant1\_NTNV



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

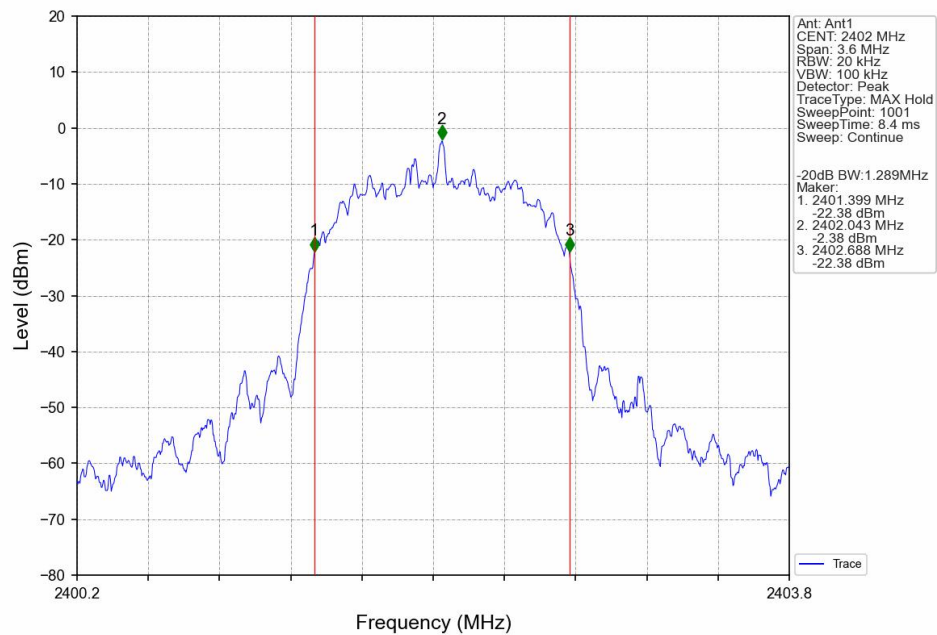


FCC ID: 2APOQ-T104A

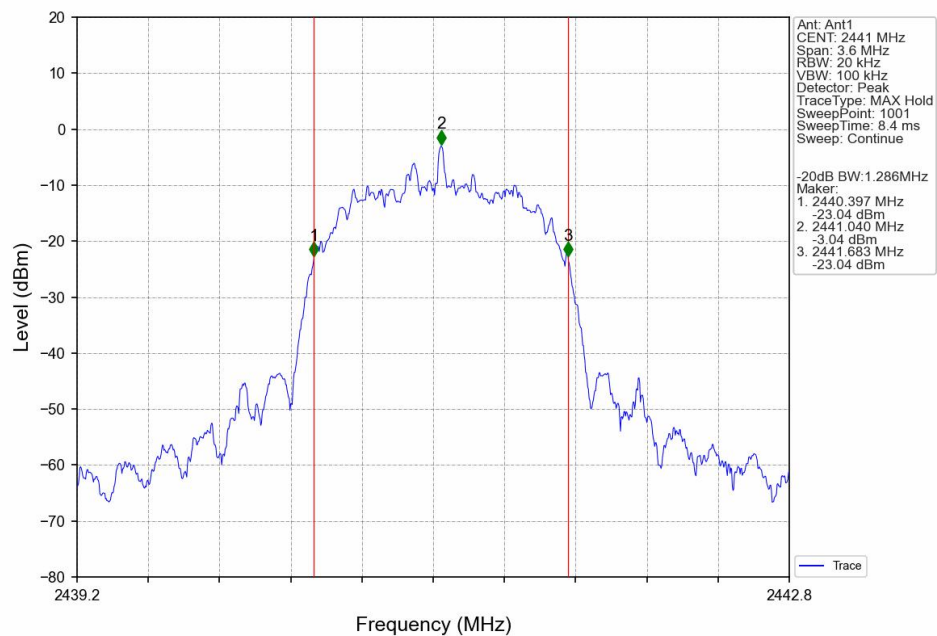


FCC ID: 2APOQ-T104A

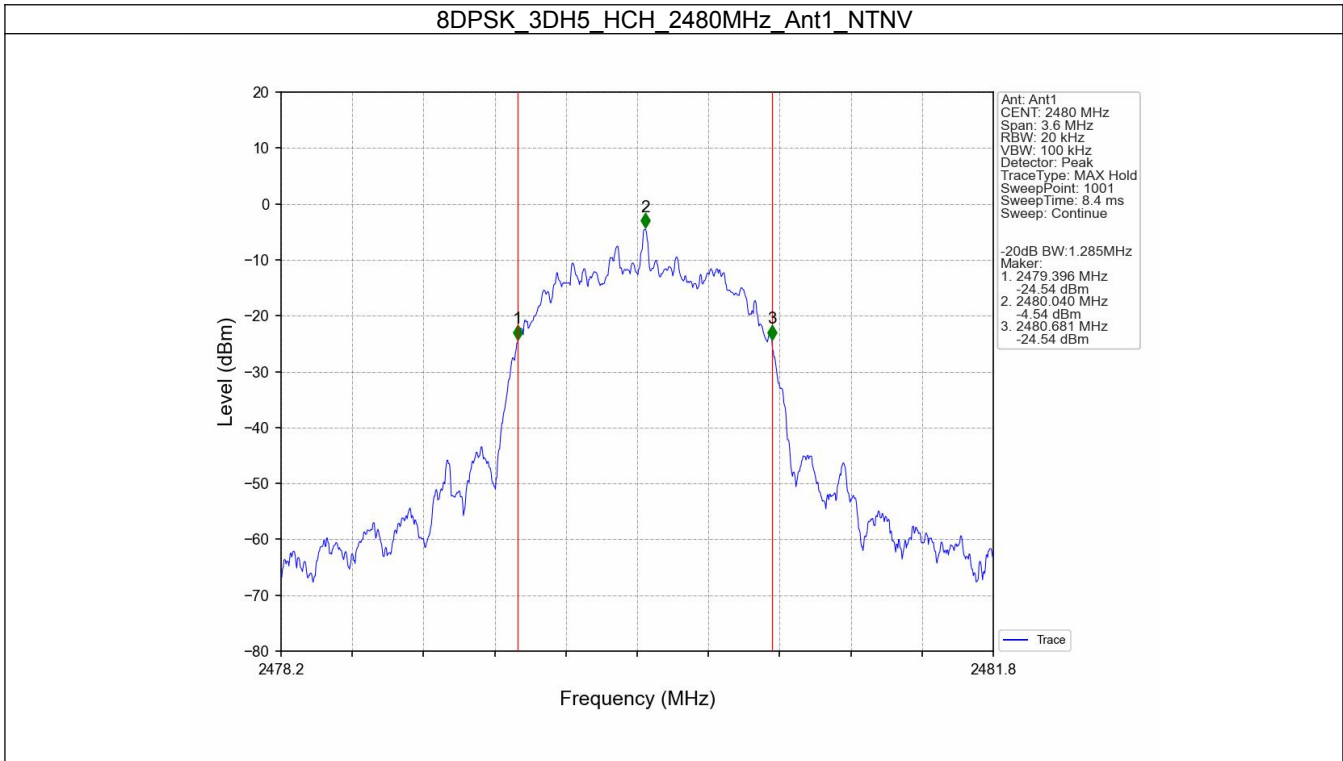
8DPSK\_3DH5\_LCH\_2402MHz\_Ant1\_NTNV



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



FCC ID: 2APOQ-T104A



FCC ID: 2APOQ-T104A

## 2. Maximum Conducted Output Power

### 2.1 Test Result

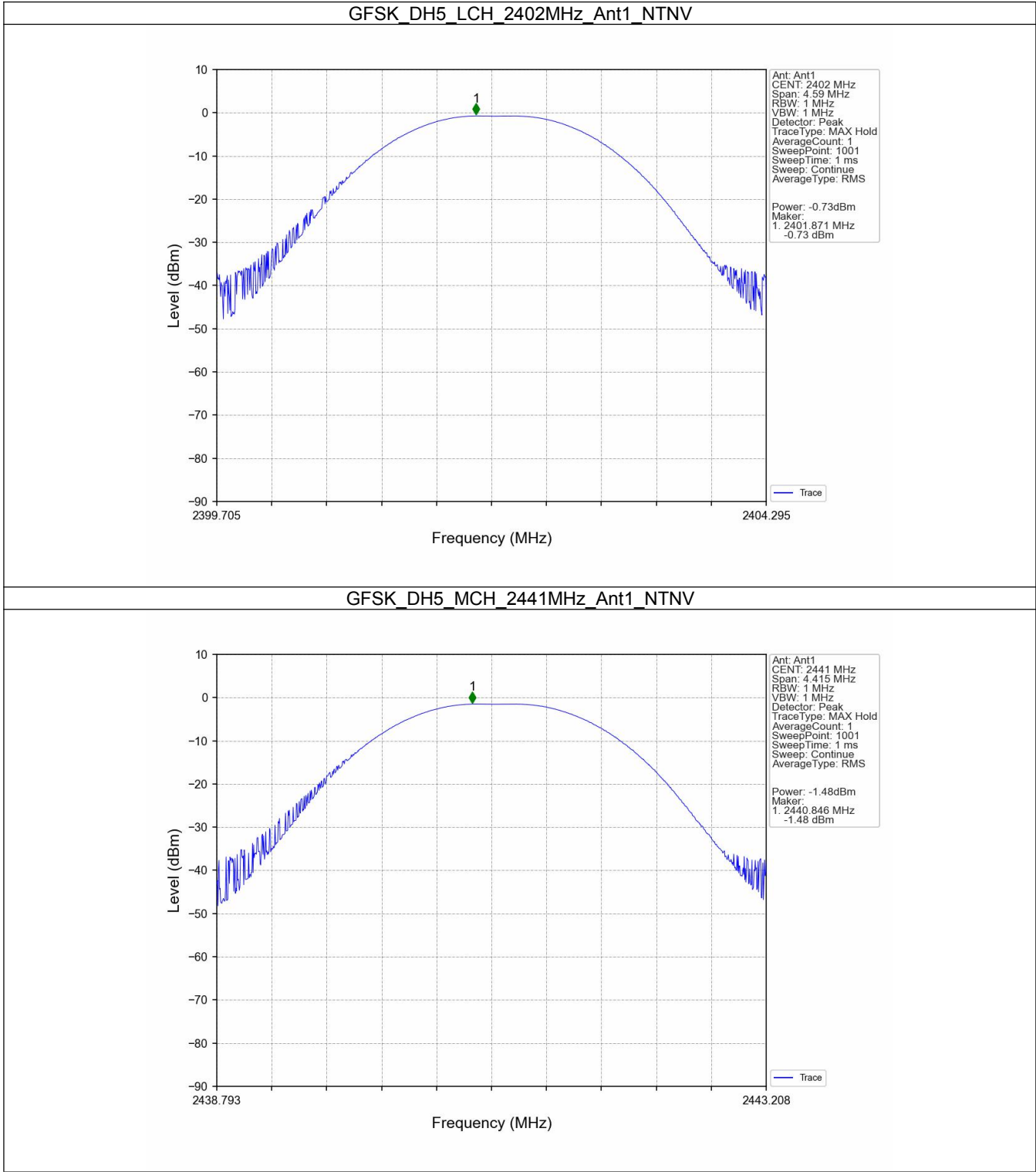
#### 2.1.1 Power

| Mode                                | TX Type | Frequency (MHz) | Packet Type | Maximum Peak Conducted Output Power (dBm) |         | Verdict |
|-------------------------------------|---------|-----------------|-------------|-------------------------------------------|---------|---------|
|                                     |         |                 |             | ANT1                                      | Limit   |         |
| GFSK                                | SISO    | 2402            | DH5         | -0.73                                     | <=30    | Pass    |
|                                     |         | 2441            | DH5         | -1.48                                     | <=30    | Pass    |
|                                     |         | 2480            | DH5         | -2.82                                     | <=30    | Pass    |
| Pi/4DQPSK                           | SISO    | 2402            | 2DH5        | 1.43                                      | <=20.97 | Pass    |
|                                     |         | 2441            | 2DH5        | 0.72                                      | <=20.97 | Pass    |
|                                     |         | 2480            | 2DH5        | -0.69                                     | <=20.97 | Pass    |
| 8DPSK                               | SISO    | 2402            | 3DH5        | 1.95                                      | <=20.97 | Pass    |
|                                     |         | 2441            | 3DH5        | 1.23                                      | <=20.97 | Pass    |
|                                     |         | 2480            | 3DH5        | -0.15                                     | <=20.97 | Pass    |
| Note1: Antenna Gain: Ant1: 0.07dBi; |         |                 |             |                                           |         |         |

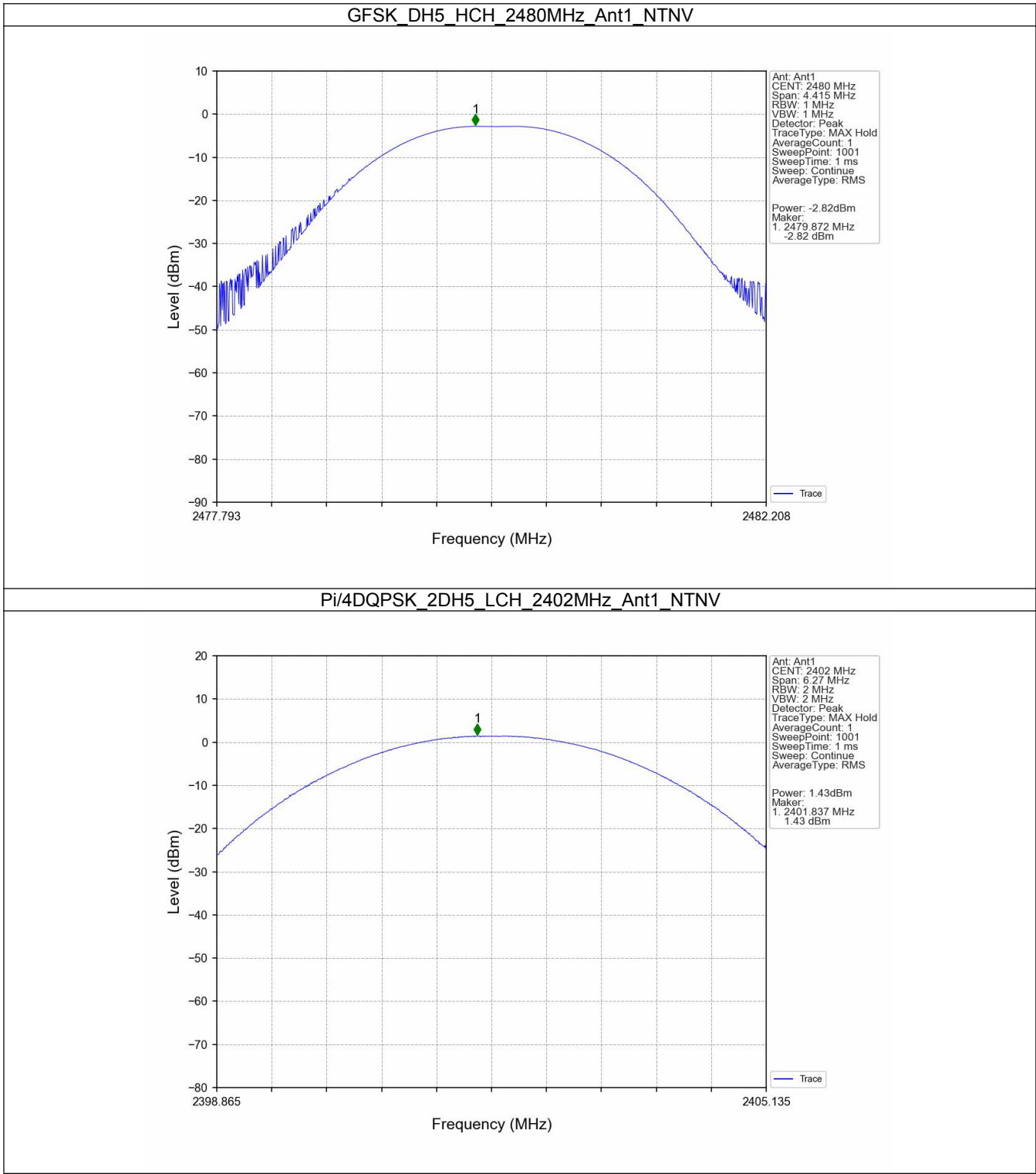
FCC ID: 2APOQ-T104A

2.2 Test Graph

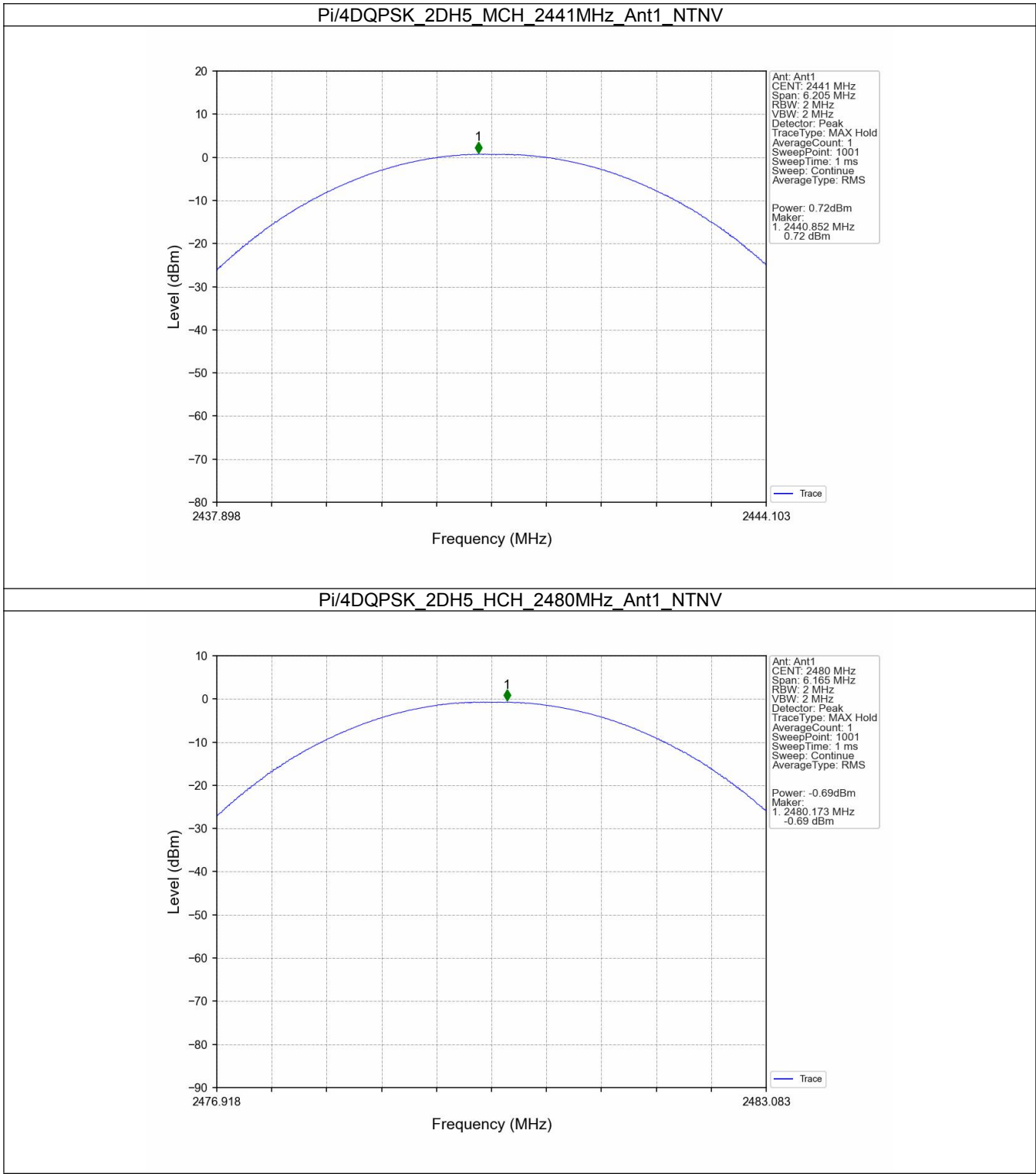
2.2.1 Power



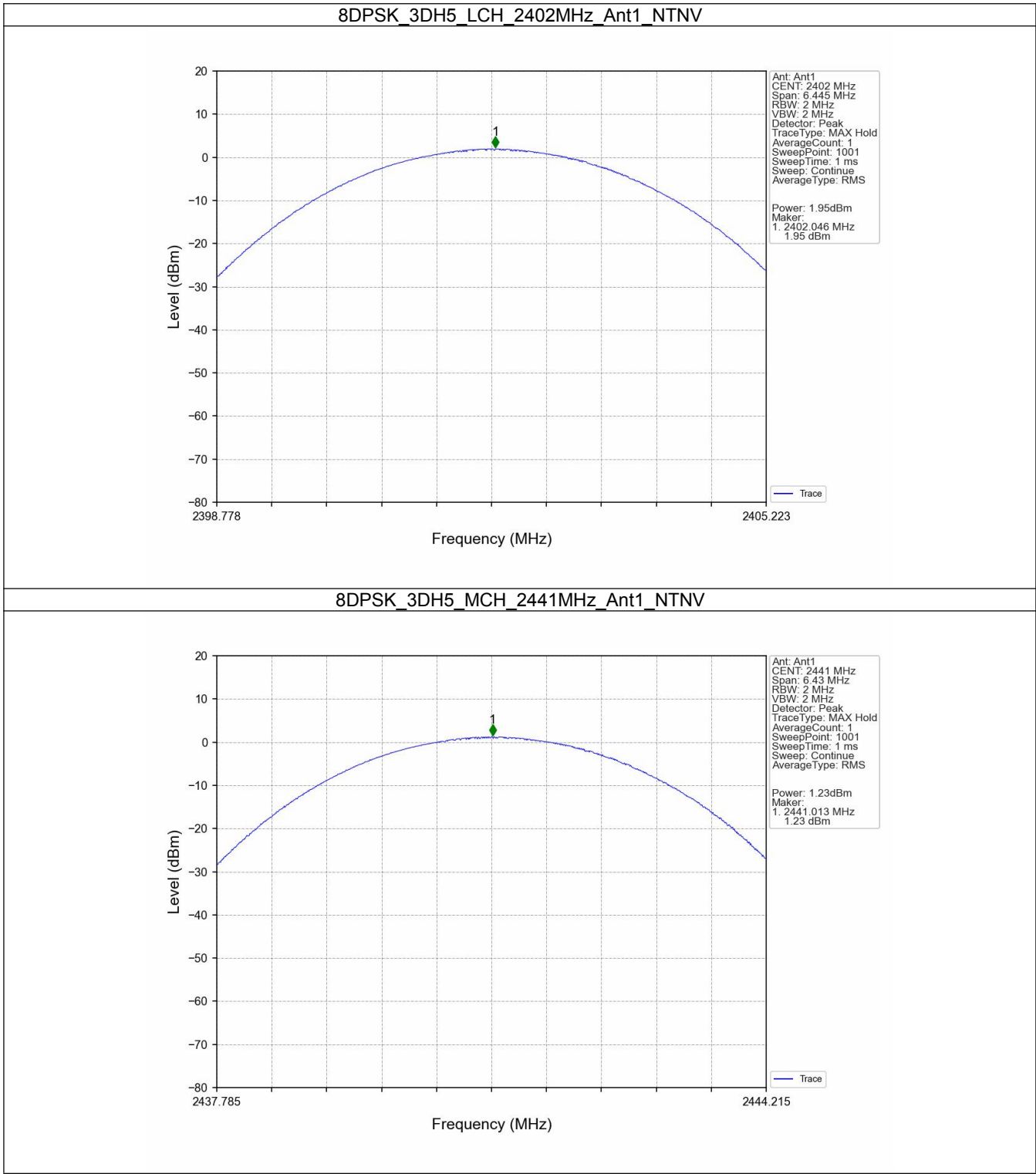
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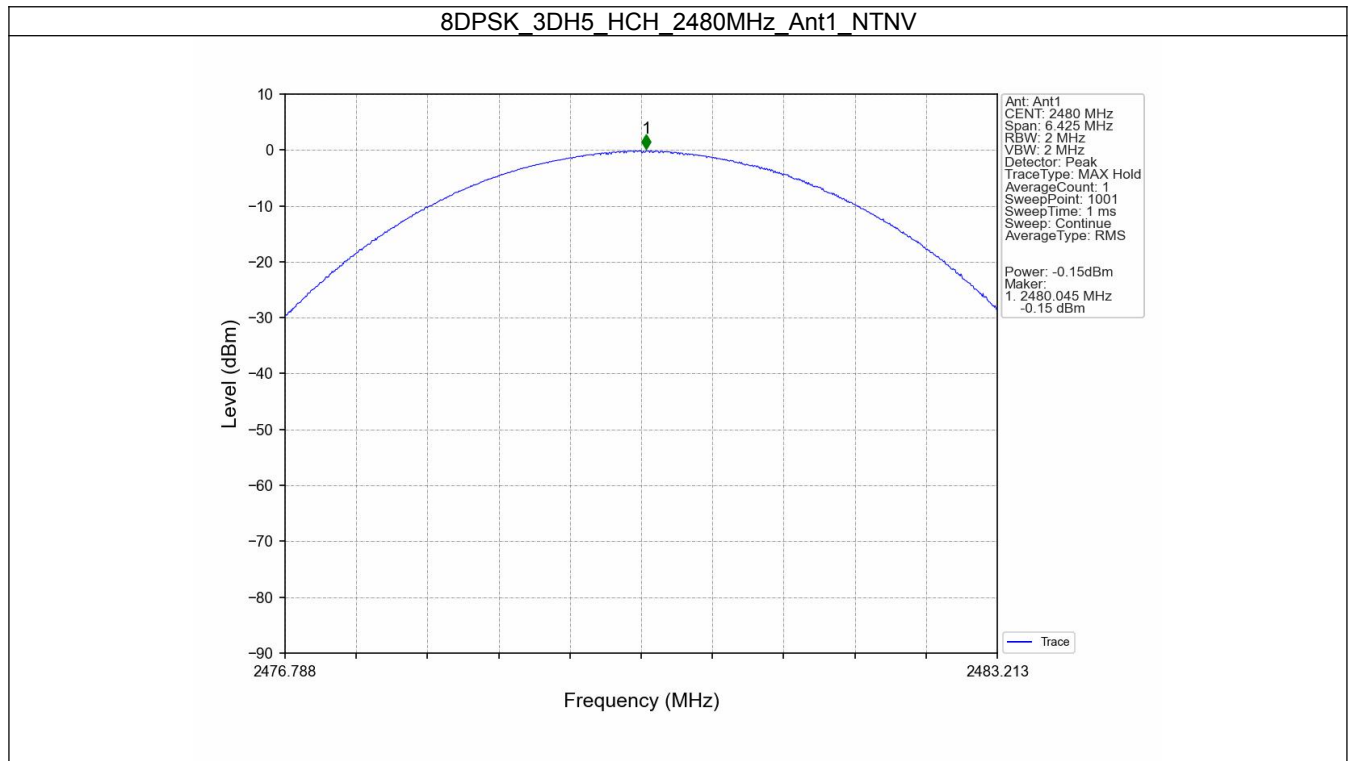
FCC ID: 2APOQ-T104A



FCC ID: 2APOQ-T104A



FCC ID: 2APOQ-T104A



FCC ID: 2APOQ-T104A

### 3. Carrier Frequency Separation

#### 3.1 Test Result

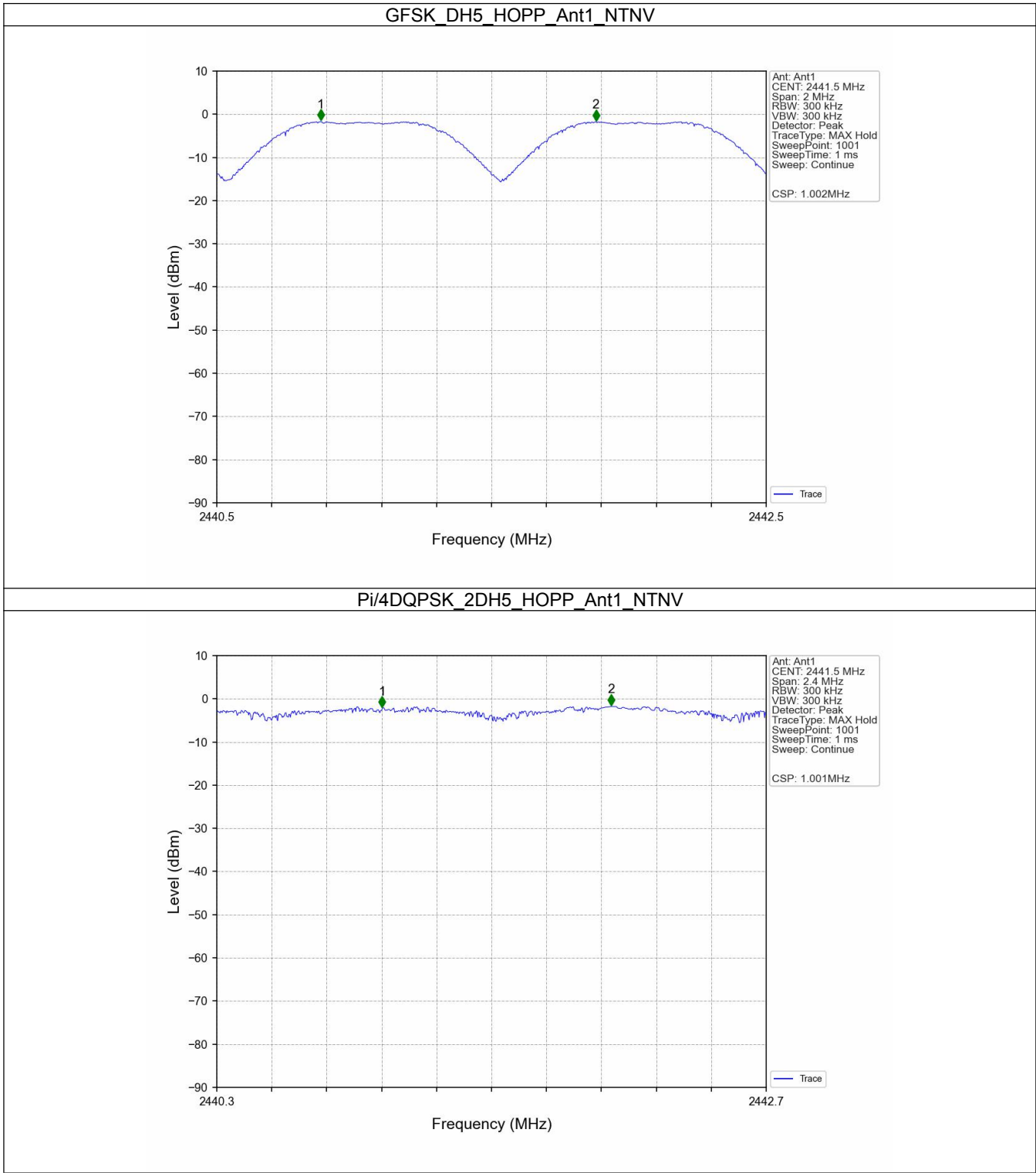
##### 3.1.1 Ant1

| Ant1      |         |                 |             |                          |                      |              |         |
|-----------|---------|-----------------|-------------|--------------------------|----------------------|--------------|---------|
| Mode      | TX Type | Frequency (MHz) | Packet Type | Channel Separation (MHz) | 20dB Bandwidth (MHz) | Limit (MHz)  | Verdict |
| GFSK      | SISO    | HOPP            | DH5         | 1.002                    | 0.918                | $\geq 0.918$ | Pass    |
| Pi/4DQPSK | SISO    | HOPP            | 2DH5        | 1.001                    | 1.254                | $\geq 0.836$ | Pass    |
| 8DPSK     | SISO    | HOPP            | 3DH5        | 0.996                    | 1.289                | $\geq 0.859$ | Pass    |

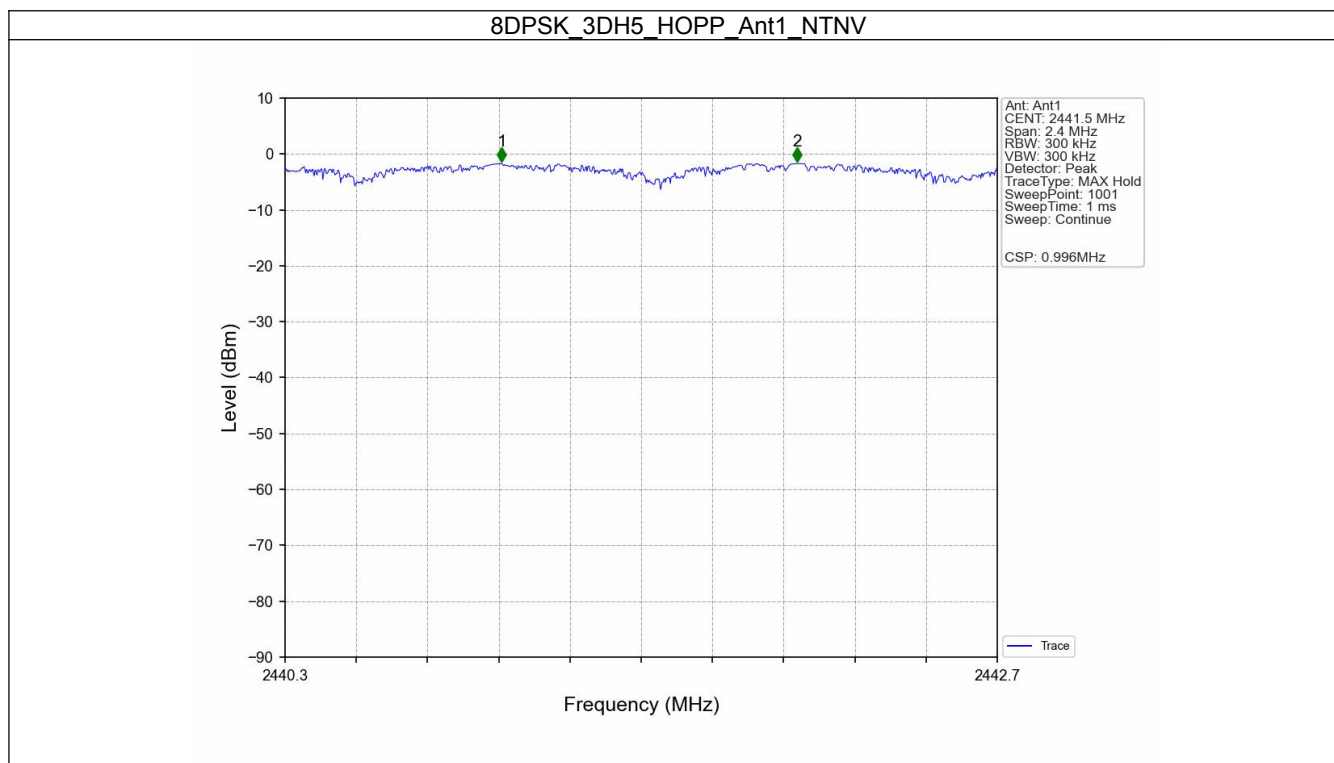
FCC ID: 2APOQ-T104A

3.2 Test Graph

3.2.1 Ant1



FCC ID: 2APOQ-T104A



FCC ID: 2APOQ-T104A

## 4. Number of Hopping Frequencies

### 4.1 Test Result

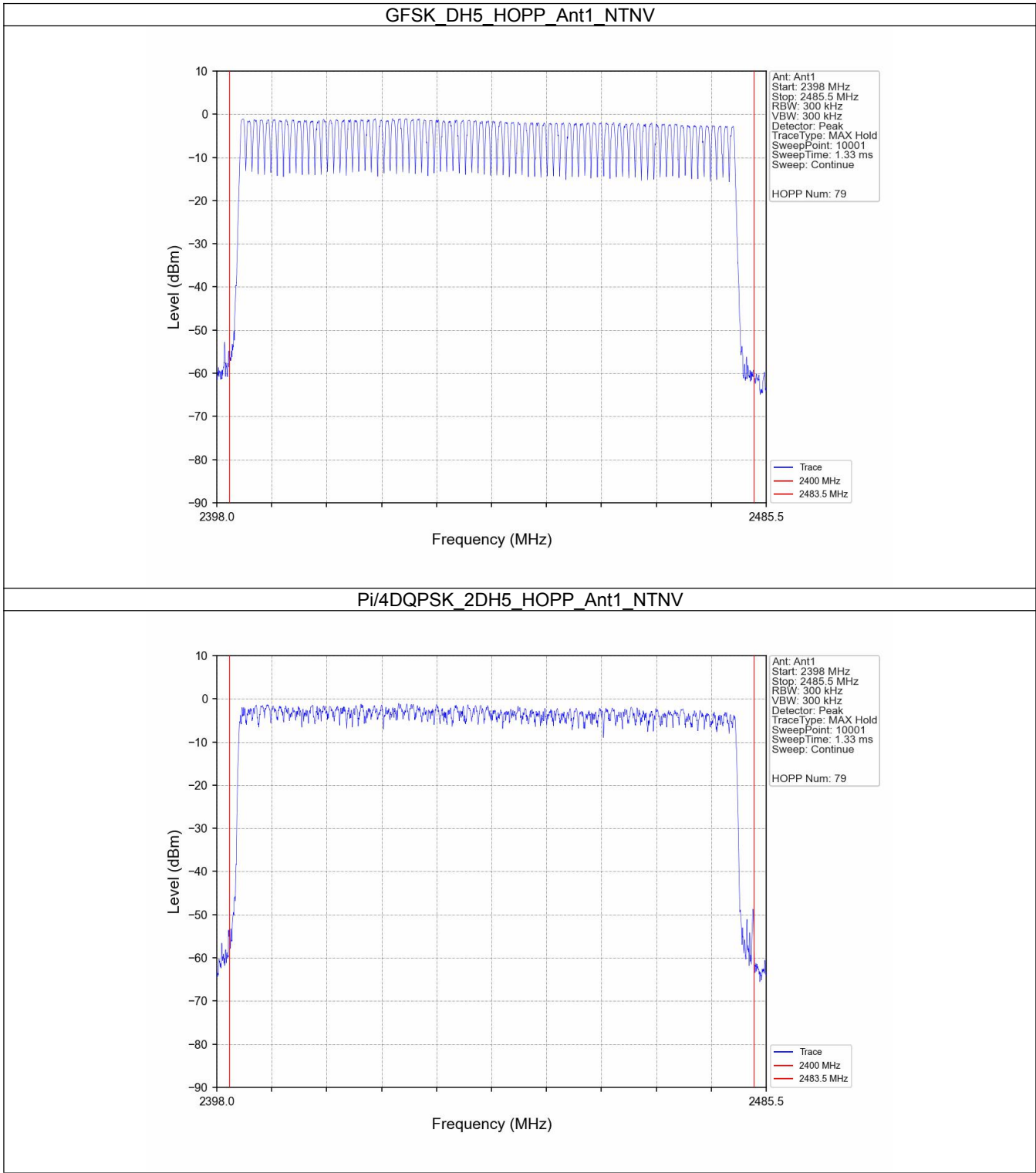
#### 4.1.1 HoppNum

| 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    |

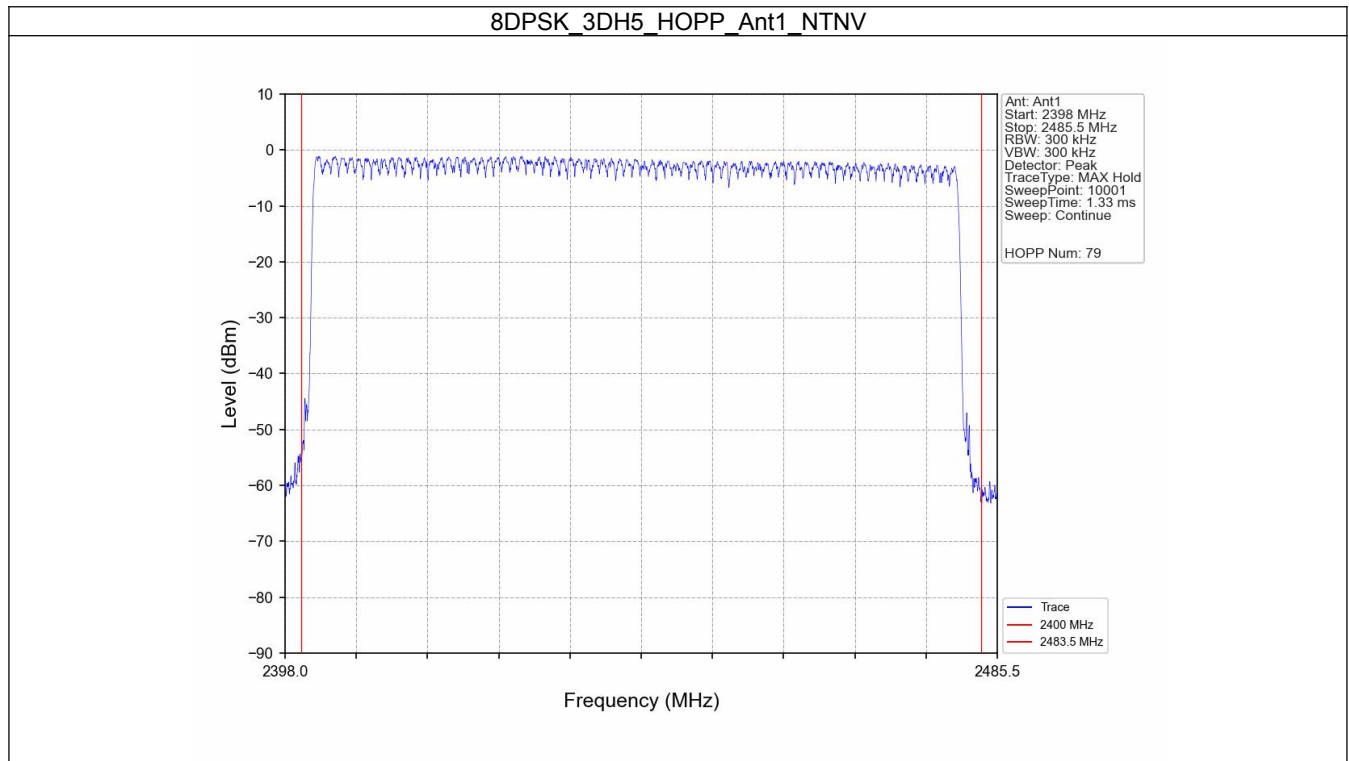
FCC ID: 2APOQ-T104A

4.2 Test Graph

4.2.1 HoppNum



FCC ID: 2APOQ-T104A



FCC ID: 2APOQ-T104A

## 5. Time of Occupancy (Dwell Time)

### 5.1 Test Result

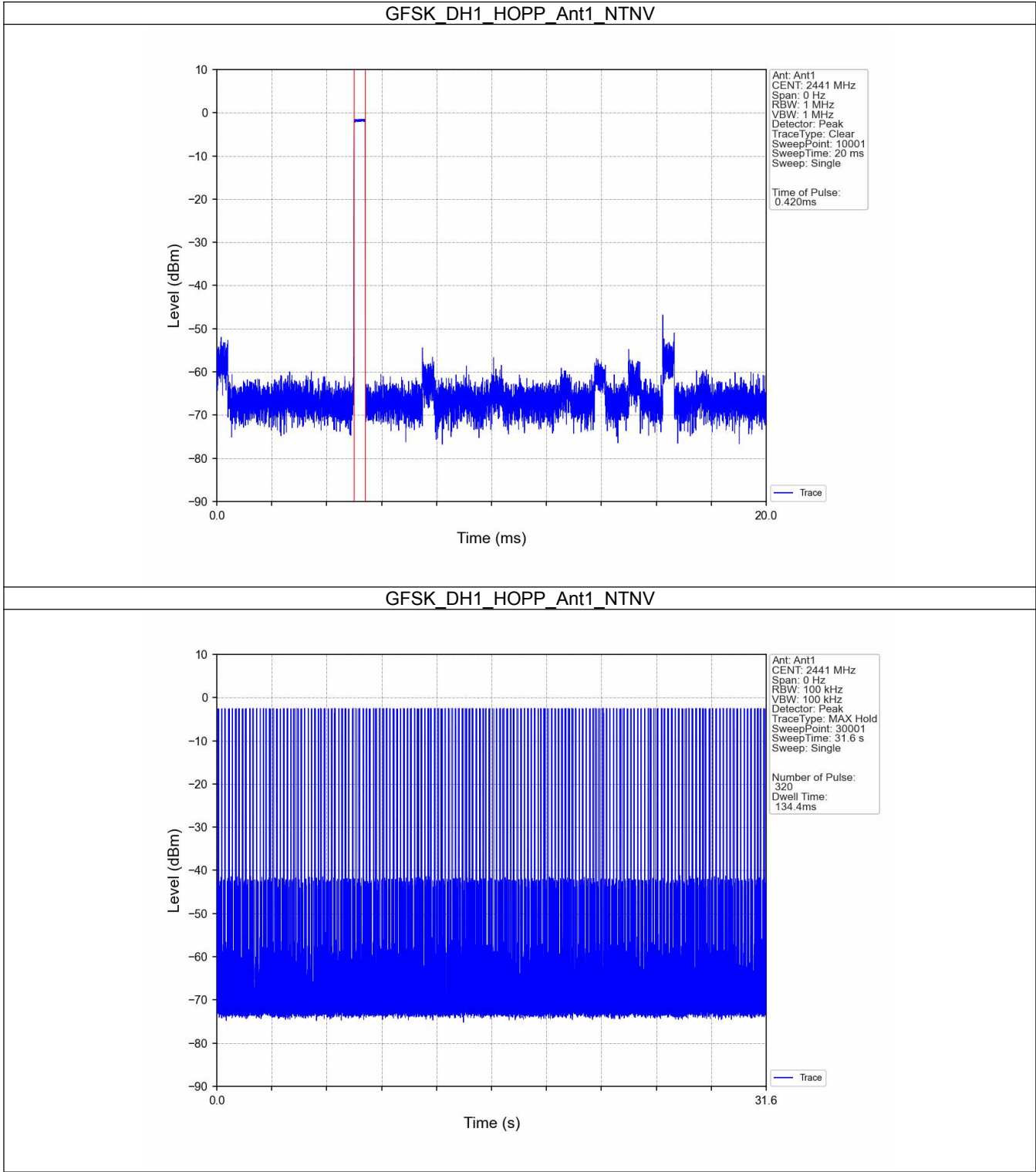
#### 5.1.1 Ant1

| 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         | 0.420                         | 31.600                 | 320                                | 134.400         | <=400      | Pass    |
|           |         |                 | DH3         | 1.676                         | 31.600                 | 165                                | 276.540         | <=400      | Pass    |
|           |         |                 | DH5         | 2.924                         | 31.600                 | 116                                | 339.184         | <=400      | Pass    |
| Pi/4DQPSK | SISO    | HOPP            | 2DH1        | 0.426                         | 31.600                 | 319                                | 135.894         | <=400      | Pass    |
|           |         |                 | 2DH3        | 1.682                         | 31.600                 | 162                                | 272.484         | <=400      | Pass    |
|           |         |                 | 2DH5        | 2.930                         | 31.600                 | 105                                | 307.650         | <=400      | Pass    |
| 8DPSK     | SISO    | HOPP            | 3DH1        | 0.436                         | 31.600                 | 320                                | 139.520         | <=400      | Pass    |
|           |         |                 | 3DH3        | 1.686                         | 31.600                 | 163                                | 274.818         | <=400      | Pass    |
|           |         |                 | 3DH5        | 2.946                         | 31.600                 | 109                                | 321.114         | <=400      | Pass    |

FCC ID: 2APOQ-T104A

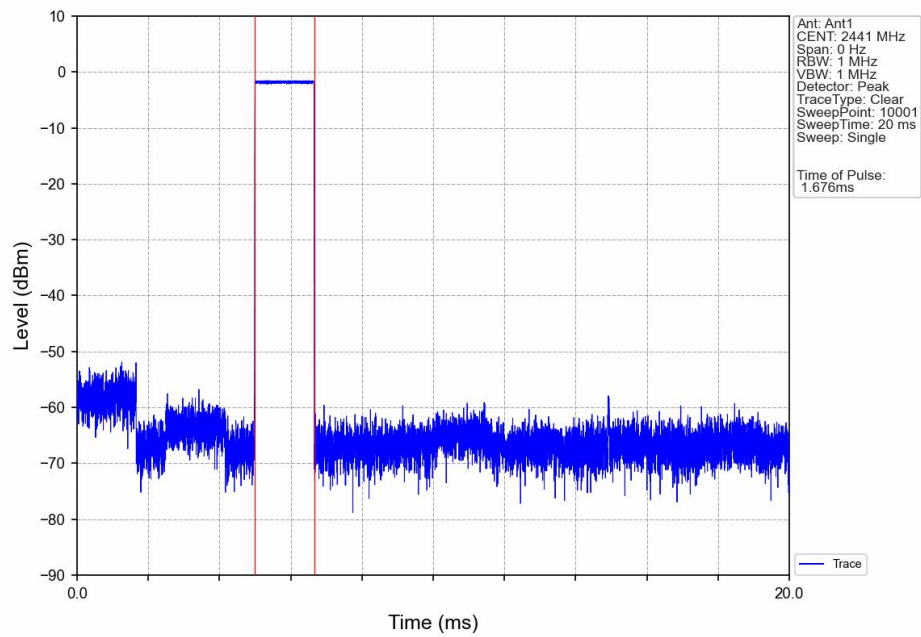
5.2 Test Graph

5.2.1 Ant1

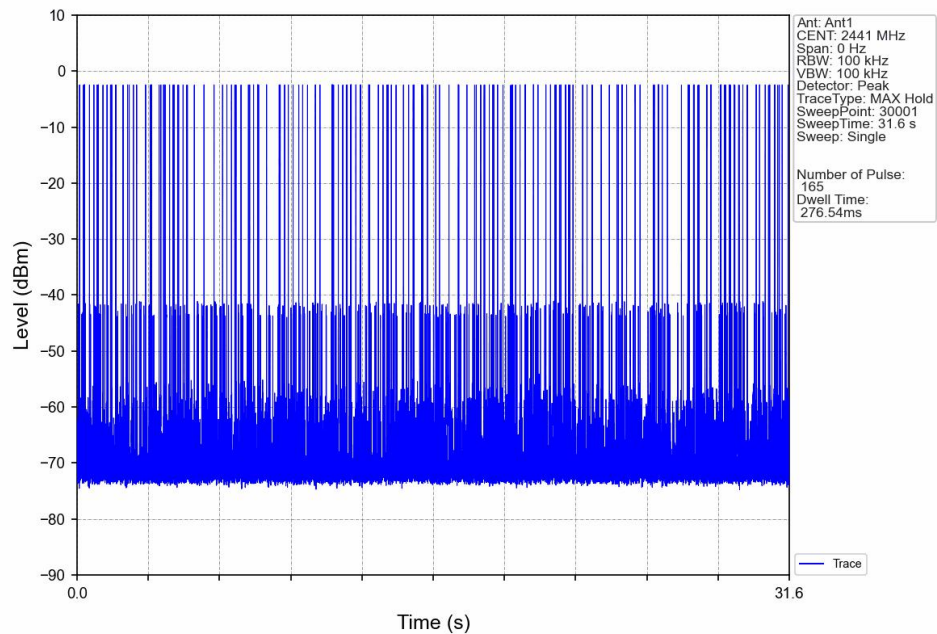


FCC ID: 2APOQ-T104A

## GFSK\_DH3\_HOPP\_Ant1\_NTNV

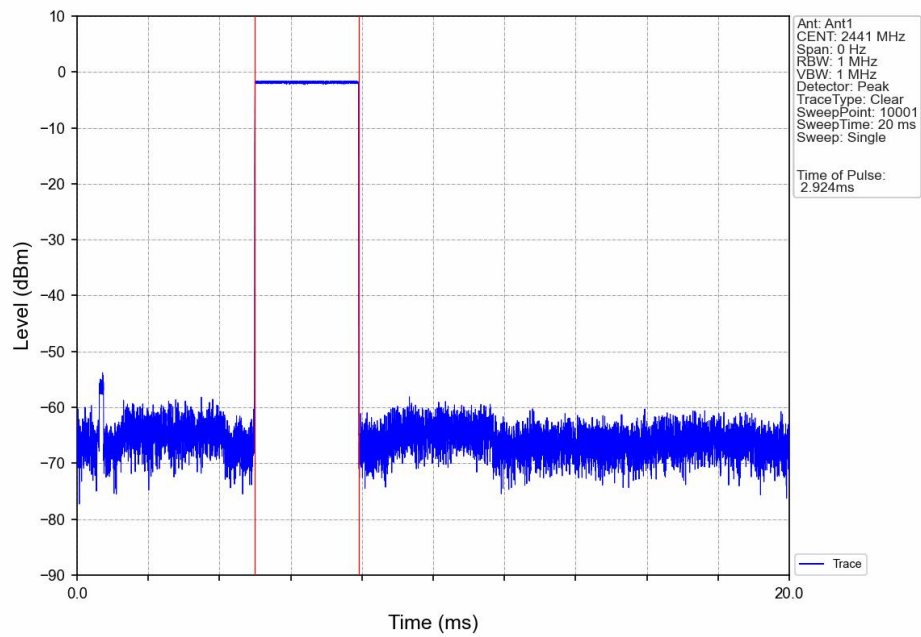


## GFSK\_DH3\_HOPP\_Ant1\_NTNV

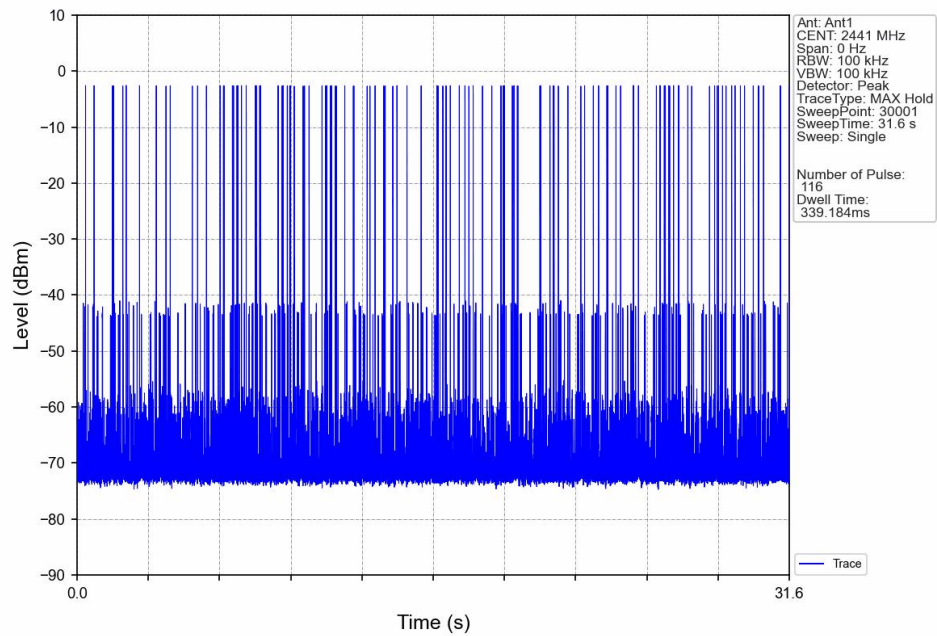


FCC ID: 2APOQ-T104A

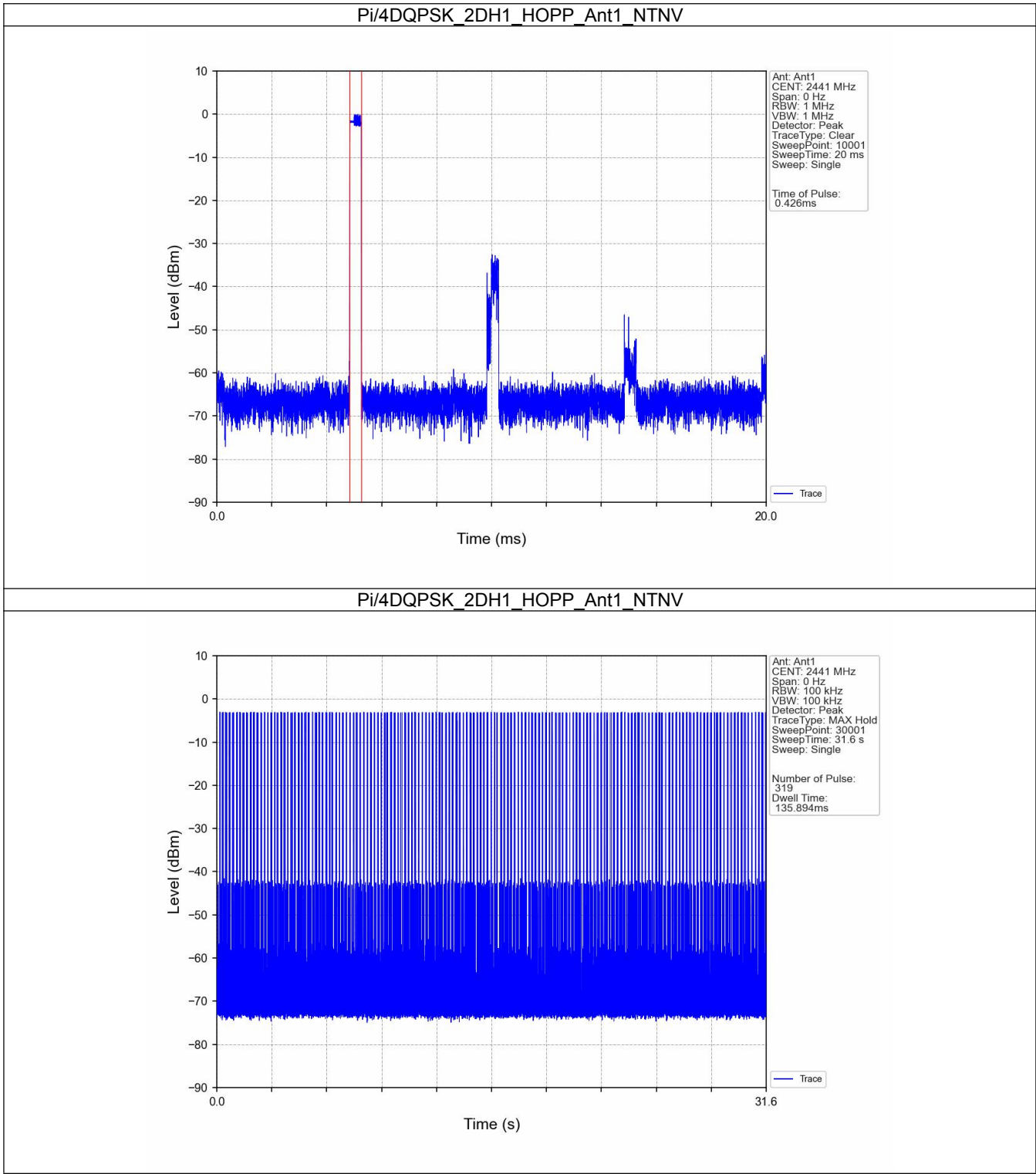
GFSK\_DH5\_HOPP\_Ant1\_NTNV



GFSK\_DH5\_HOPP\_Ant1\_NTNV

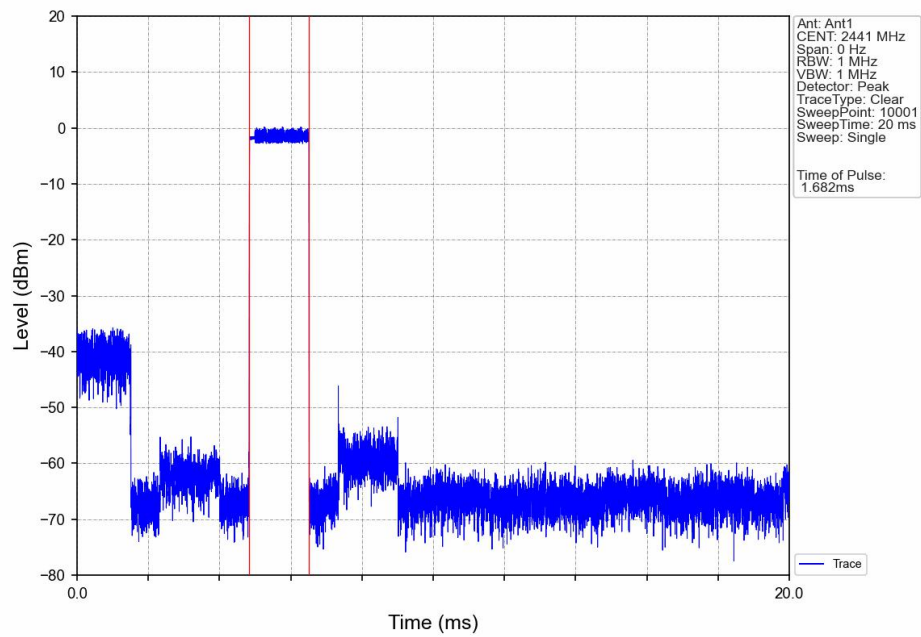


FCC ID: 2APOQ-T104A

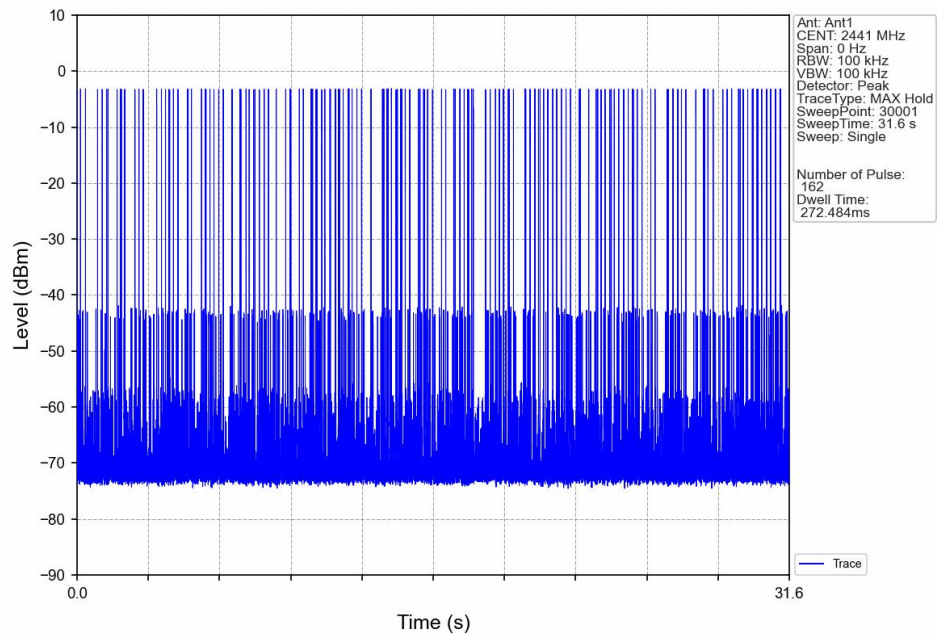


FCC ID: 2APOQ-T104A

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

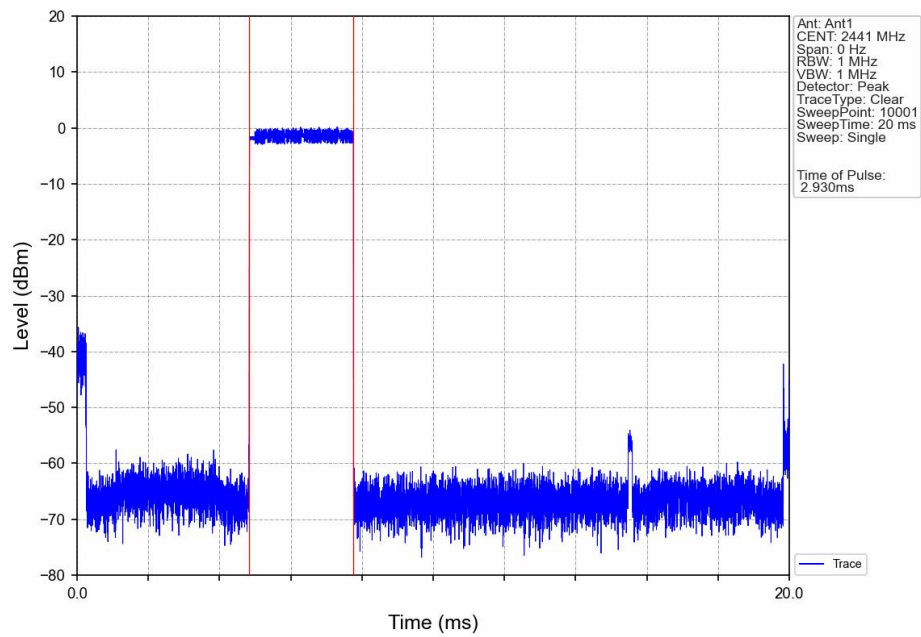


Pi/4DQPSK\_2DH3\_HOPP\_Ant1\_NTNV

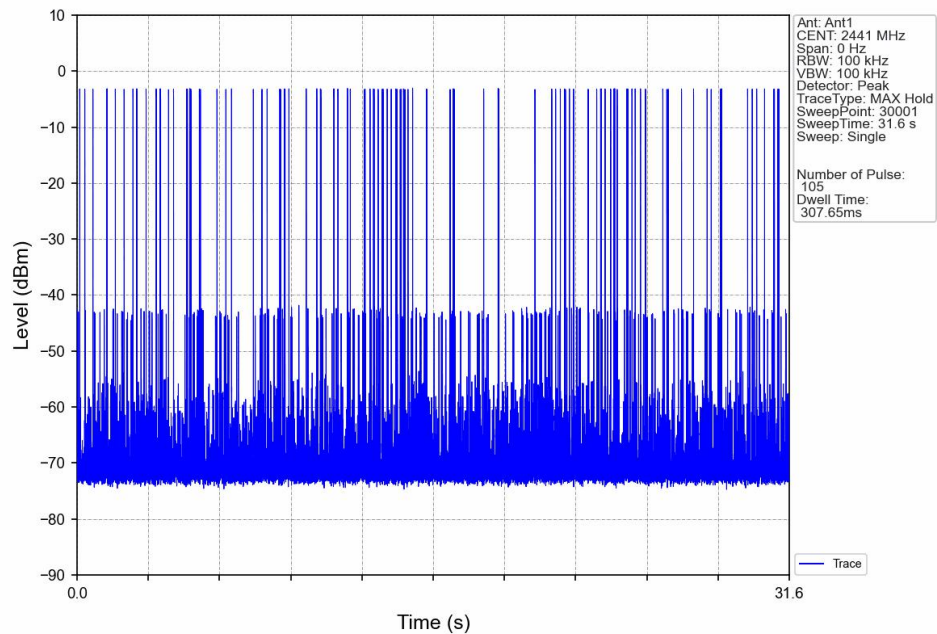


FCC ID: 2APOQ-T104A

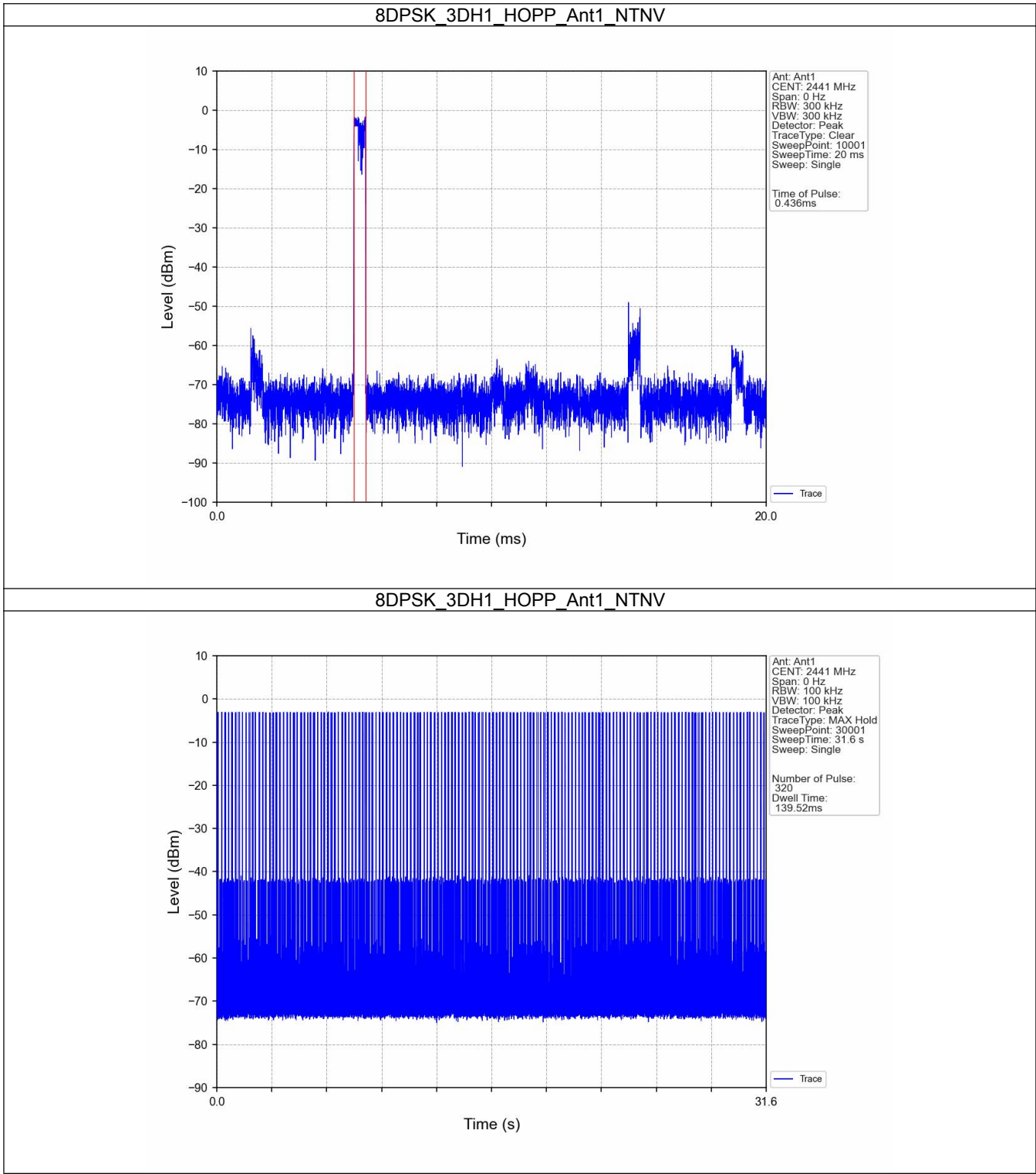
Pi/4DQPSK\_2DH5\_HOPP\_Ant1\_NTNV



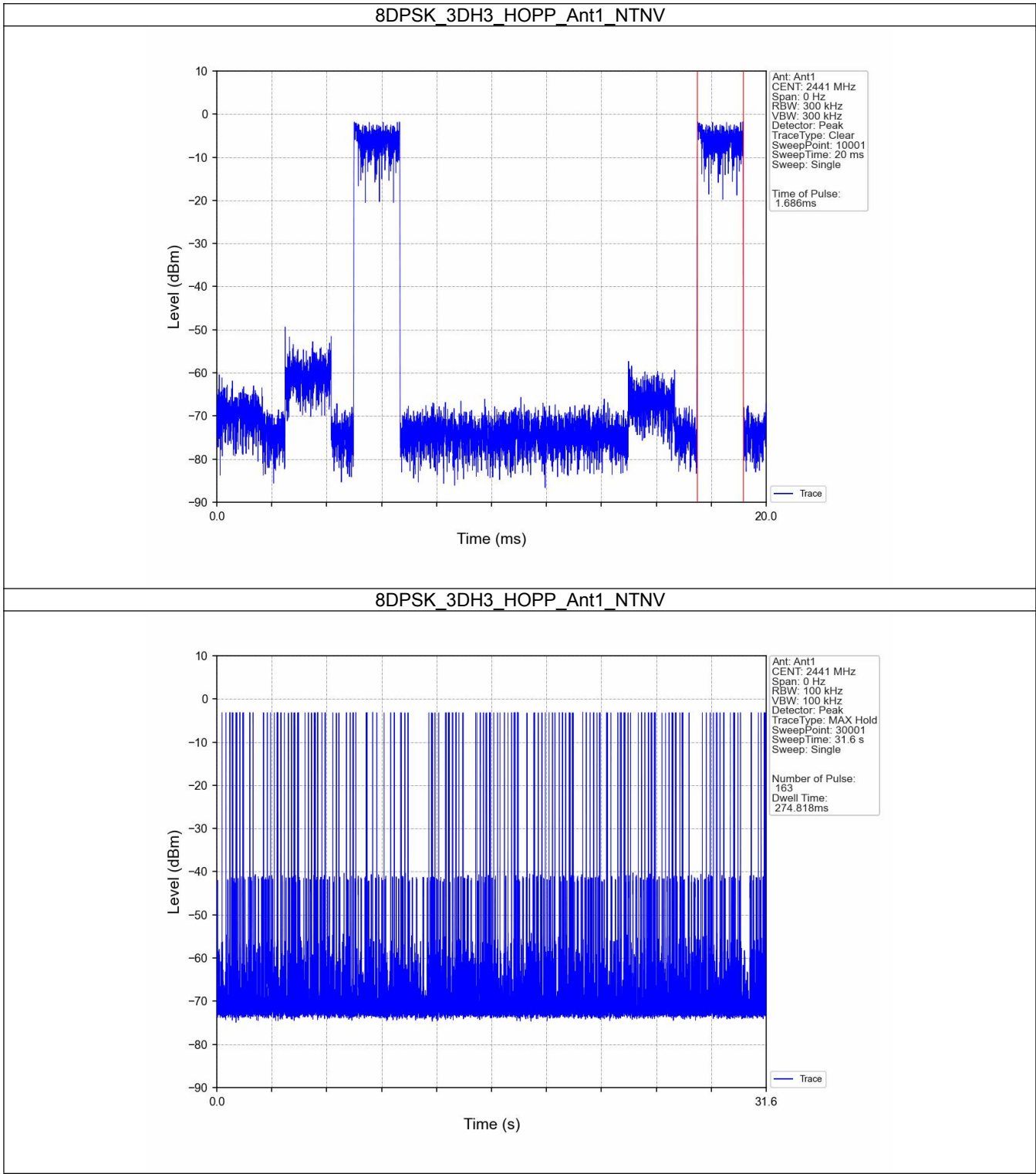
Pi/4DQPSK\_2DH5\_HOPP\_Ant1\_NTNV



FCC ID: 2APOQ-T104A

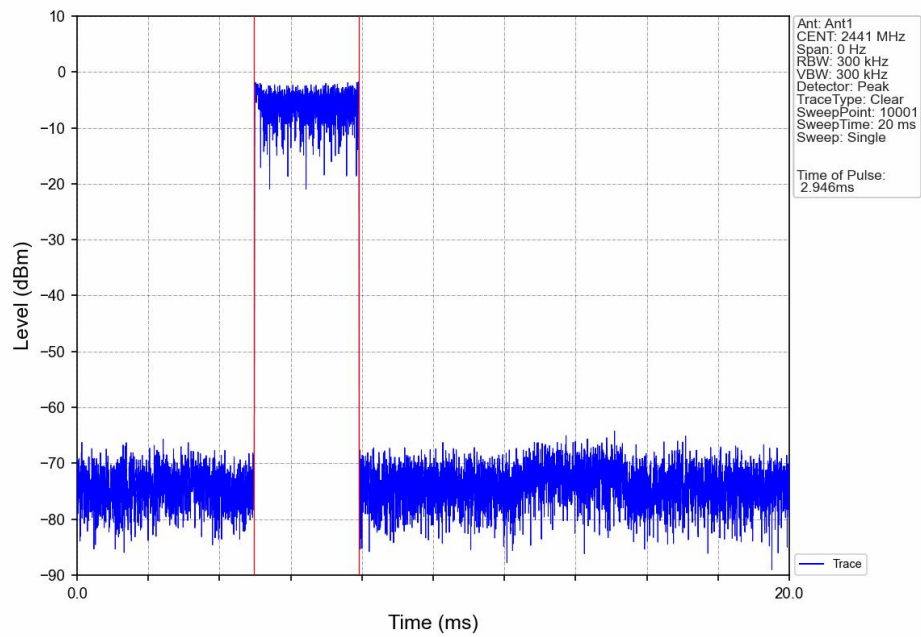


FCC ID: 2APOQ-T104A

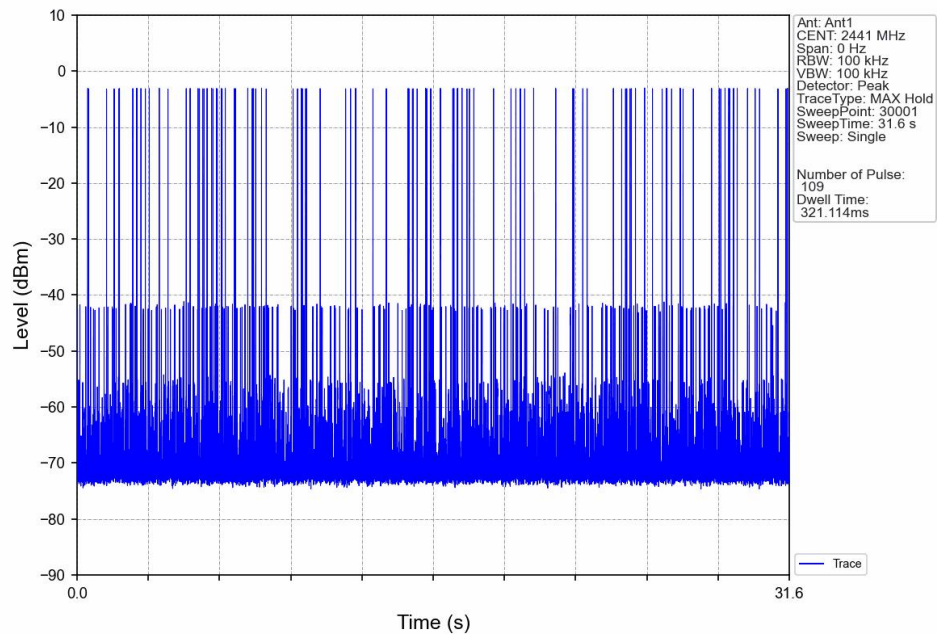


FCC ID: 2APOQ-T104A

8DPSK\_3DH5\_HOPP\_Ant1\_NTNV



8DPSK\_3DH5\_HOPP\_Ant1\_NTNV



FCC ID: 2APOQ-T104A

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

### 6.1 Test Result

#### 6.1.1 Ref

| Mode      | TX Type | Frequency (MHz) | Packet Type | ANT | Level of Reference (dBm) |
|-----------|---------|-----------------|-------------|-----|--------------------------|
| GFSK      | SISO    | 2402            | DH5         | 1   | -1.05                    |
|           |         | 2441            | DH5         | 1   | -1.82                    |
|           |         | 2480            | DH5         | 1   | -3.13                    |
|           |         | HOPP            | DH5         | 1   | -1.02                    |
|           |         |                 |             |     | -1.02                    |
| Pi/4DQPSK | SISO    | 2402            | 2DH5        | 1   | -1.11                    |
|           |         | 2441            | 2DH5        | 1   | -1.75                    |
|           |         | 2480            | 2DH5        | 1   | -3.20                    |
|           |         | HOPP            | 2DH5        | 1   | -1.34                    |
|           |         |                 |             |     | -1.34                    |
| 8DPSK     | SISO    | 2402            | 3DH5        | 1   | -1.07                    |
|           |         | 2441            | 3DH5        | 1   | -1.82                    |
|           |         | 2480            | 3DH5        | 1   | -3.19                    |
|           |         | HOPP            | 3DH5        | 1   | -1.18                    |
|           |         |                 |             |     | -1.18                    |

#### 6.1.2 CSE

| Mode      | TX Type | Frequency (MHz) | Packet Type | ANT | Level of Reference (dBm) | Limit (dBm) | Verdict |
|-----------|---------|-----------------|-------------|-----|--------------------------|-------------|---------|
| GFSK      | SISO    | 2402            | DH5         | 1   | -1.05                    | -21.05      | Pass    |
|           |         | 2441            | DH5         | 1   | -1.82                    | -21.82      | Pass    |
|           |         | 2480            | DH5         | 1   | -3.13                    | -23.13      | Pass    |
|           |         | HOPP            | DH5         | 1   | -1.02                    | -21.02      | Pass    |
|           |         |                 |             |     | -1.02                    | -21.02      | Pass    |
| Pi/4DQPSK | SISO    | 2402            | 2DH5        | 1   | -1.11                    | -21.11      | Pass    |
|           |         | 2441            | 2DH5        | 1   | -1.75                    | -21.75      | Pass    |
|           |         | 2480            | 2DH5        | 1   | -3.20                    | -23.20      | Pass    |
|           |         | HOPP            | 2DH5        | 1   | -1.34                    | -21.34      | Pass    |
|           |         |                 |             |     | -1.34                    | -21.34      | Pass    |
| 8DPSK     | SISO    | 2402            | 3DH5        | 1   | -1.07                    | -21.07      | Pass    |
|           |         | 2441            | 3DH5        | 1   | -1.82                    | -21.82      | Pass    |
|           |         | 2480            | 3DH5        | 1   | -3.19                    | -23.19      | Pass    |
|           |         | HOPP            | 3DH5        | 1   | -1.18                    | -21.18      | Pass    |
|           |         |                 |             |     | -1.18                    | -21.18      | Pass    |

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6.2 Test Graph

6.2.1 Ref

