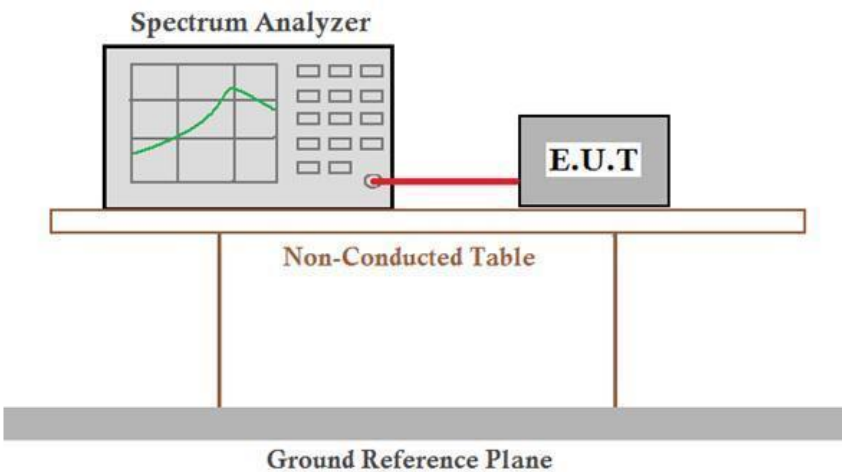


## 5.4 20dB Occupy Bandwidth

|                        |                                                                                                                                                                                                                                                                                |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement:      | 47 CFR Part 15C Section 15.247 (a)(1)                                                                                                                                                                                                                                          |
| Test Method:           | ANSI C63.10:2013                                                                                                                                                                                                                                                               |
| Test Setup:            |  <p>Remark: Offset=Cable loss+ attenuation factor.</p>                                                                                                                                       |
| Limit:                 | NA                                                                                                                                                                                                                                                                             |
| Exploratory Test Mode: | Non-hopping transmitting with all kind of modulation and all kind of data type                                                                                                                                                                                                 |
| Final Test Mode:       | Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.<br>Only the worst case is recorded in the report. |
| Test Results:          | Pass                                                                                                                                                                                                                                                                           |

### Measurement Data

#### Ant1:

| Test channel | 20dB Occupy Bandwidth (MHz) |               |       |
|--------------|-----------------------------|---------------|-------|
|              | GFSK                        | $\pi/4$ DQPSK | 8DPSK |
| Lowest       | 1.032                       | 1.347         | 1.311 |
| Middle       | 1.032                       | 1.350         | 1.293 |
| Highest      | 0.864                       | 1.296         | 1.275 |

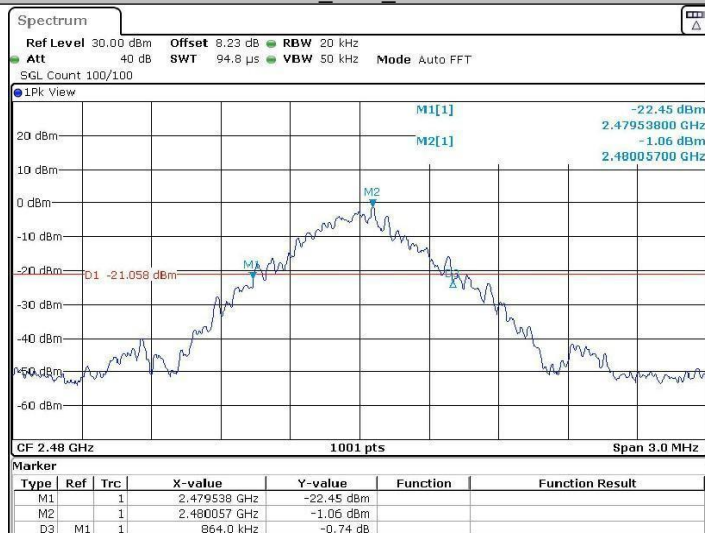
#### Ant2:

| Test channel | 20dB Occupy Bandwidth (MHz) |               |       |
|--------------|-----------------------------|---------------|-------|
|              | GFSK                        | $\pi/4$ DQPSK | 8DPSK |
| Lowest       | 0.945                       | 1.302         | 1.362 |
| Middle       | 0.936                       | 1.338         | 1.353 |
| Highest      | 0.939                       | 1.350         | 1.221 |

Test plot as follows:

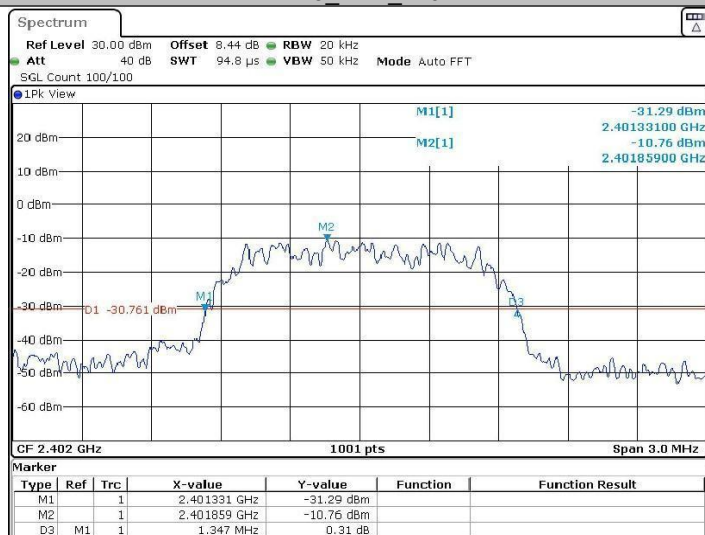


DH5\_Ant1\_2480



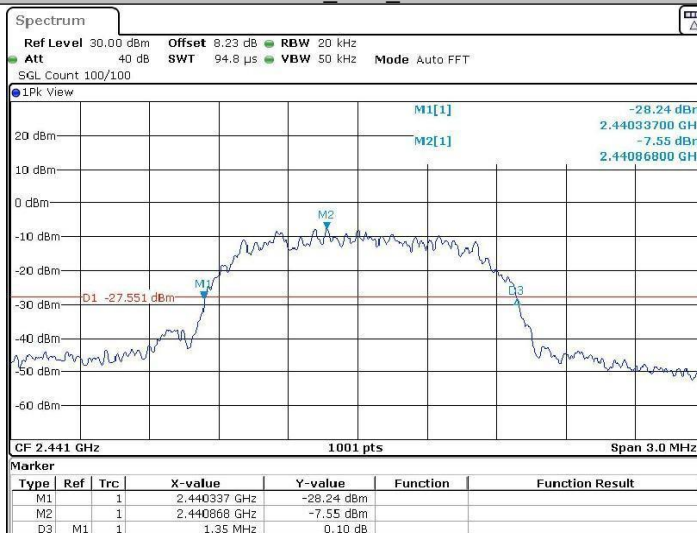
Date: 18.AUG.2022 07:04:40

2DH5\_Ant1\_2402



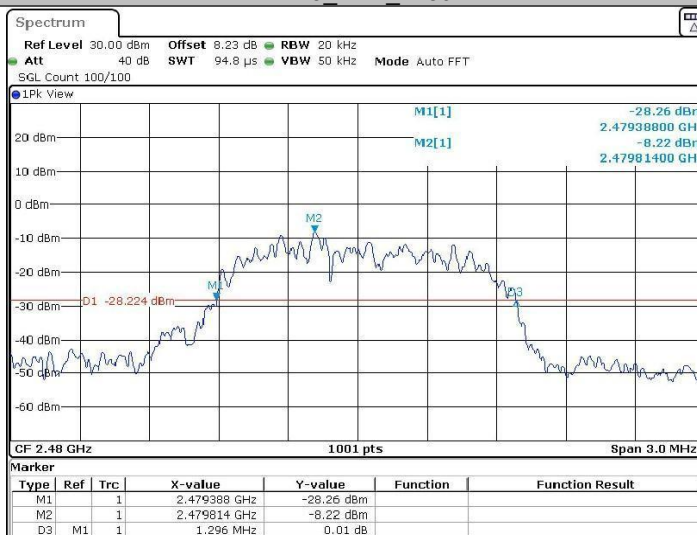
Date: 18.AUG.2022 07:08:01

2DH5\_Ant1\_2441



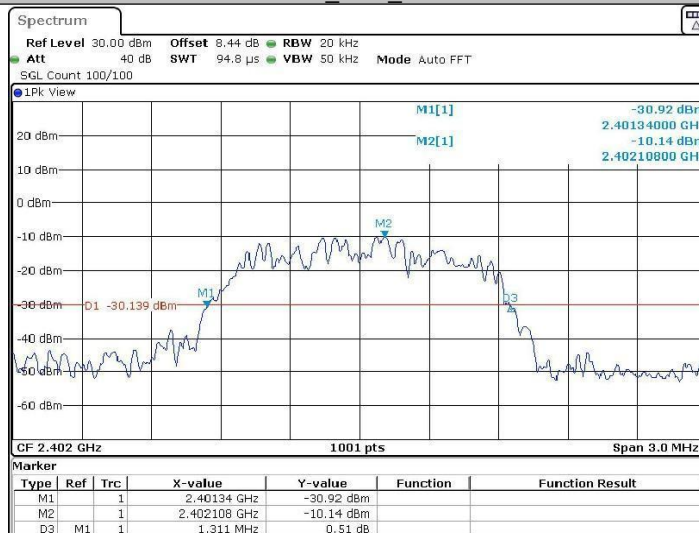
Date: 18.AUG.2022 07:10:50

2DH5\_Ant1\_2480



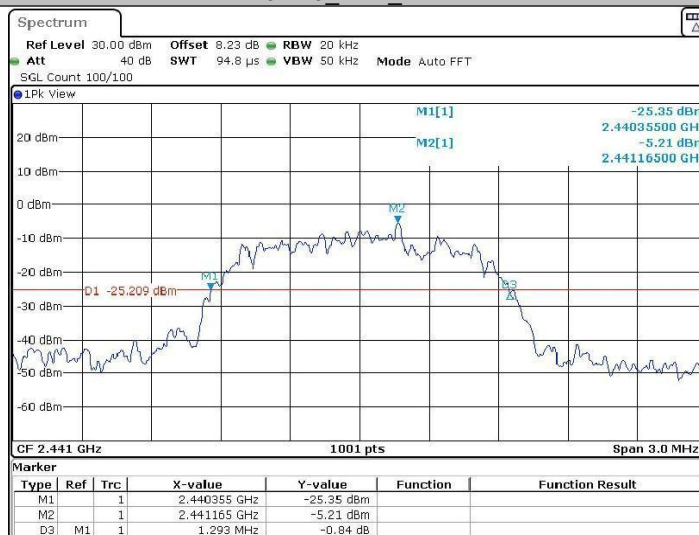
Date: 18.AUG.2022 07:12:53

3DH5\_Ant1\_2402



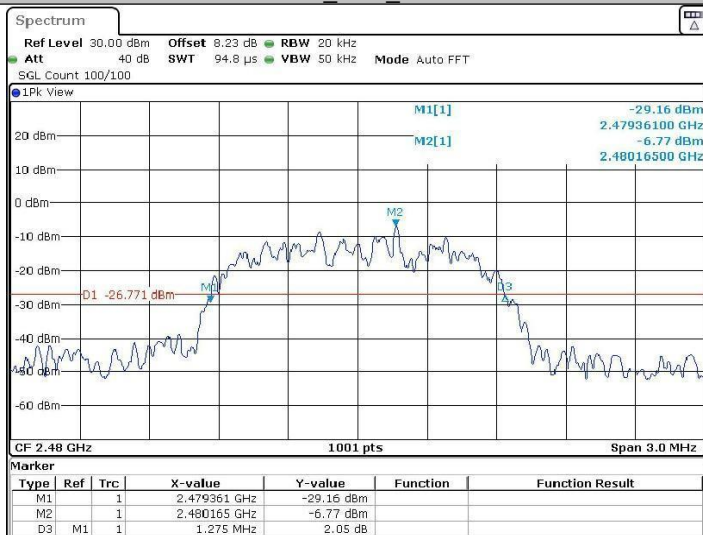
Date: 18.AUG.2022 07:15:56

3DH5\_Ant1\_2441



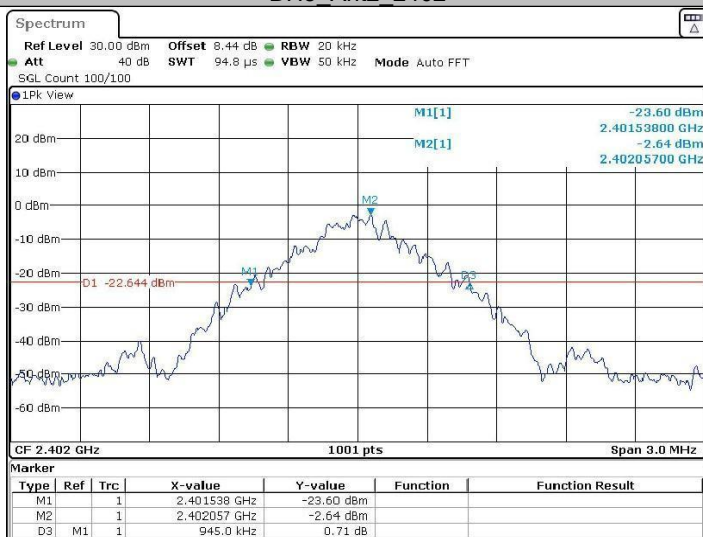
Date: 18.AUG.2022 07:19:47

3DH5\_Ant1\_2480



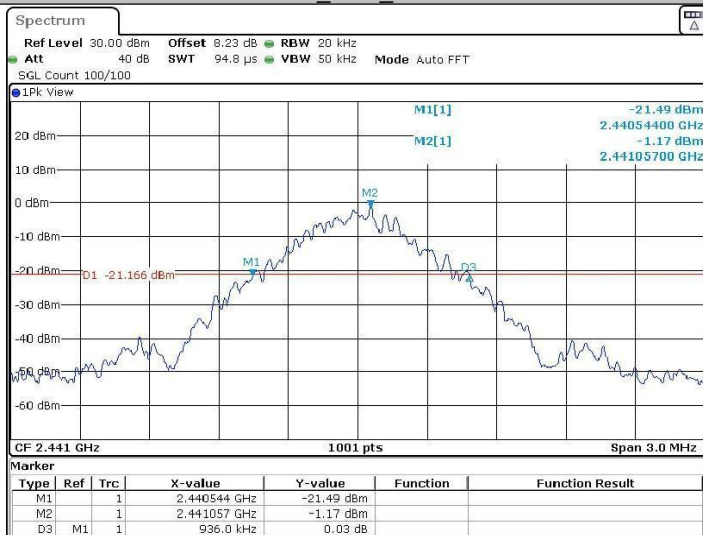
Date: 18.AUG.2022 07:21:56

DH5\_Ant2\_2402



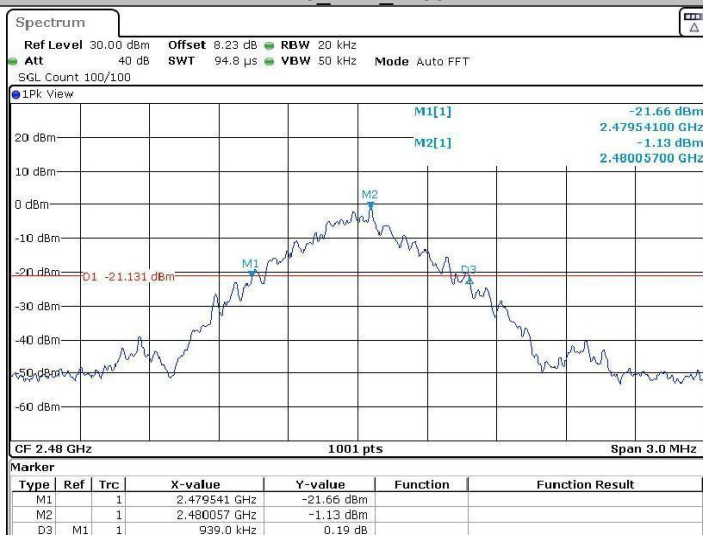
Date: 18.AUG.2022 10:27:02

DH5\_Ant2\_2441



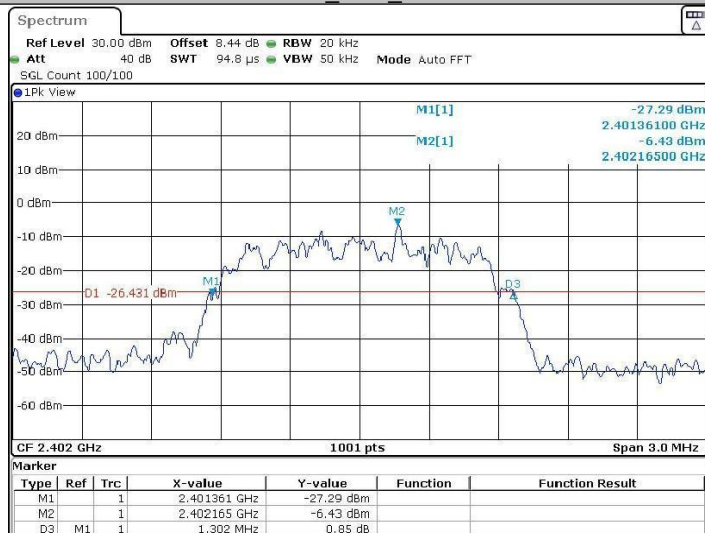
Date: 18.AUG.2022 10:30:47

DH5\_Ant2\_2480



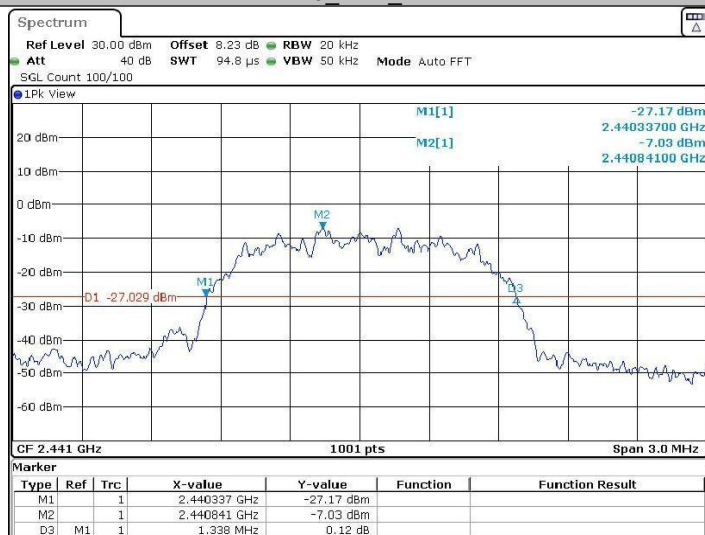
Date: 18.AUG.2022 10:32:08

2DH5\_Ant2\_2402



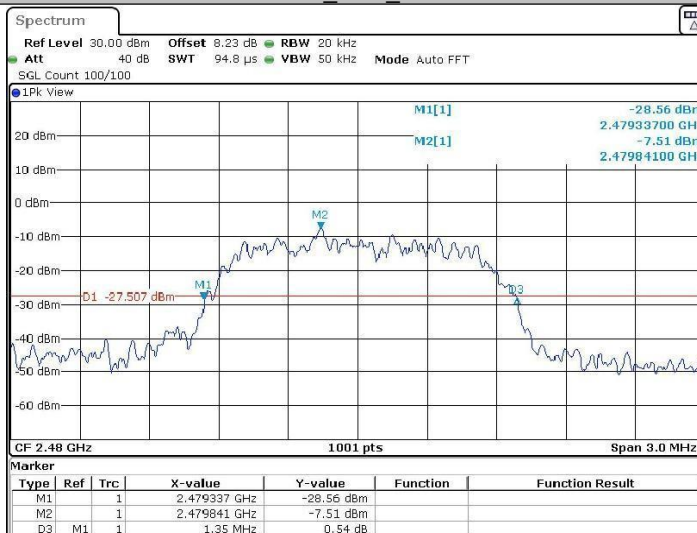
Date: 18.AUG.2022 10:35:02

2DH5\_Ant2\_2441



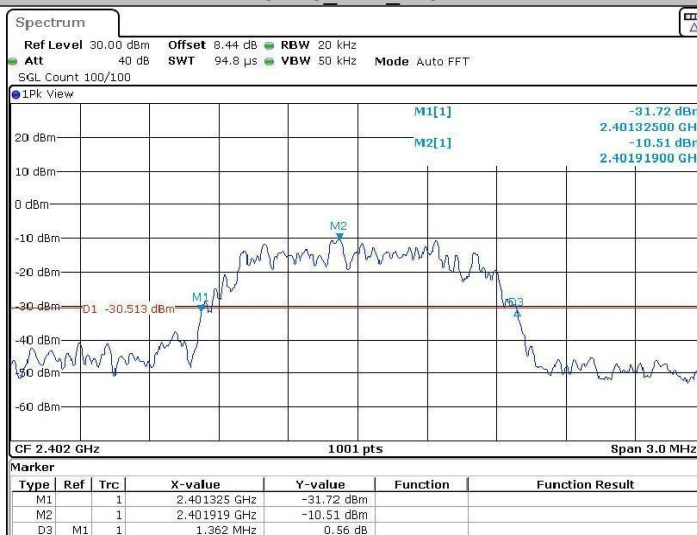
Date: 18.AUG.2022 10:37:30

2DH5\_Ant2\_2480



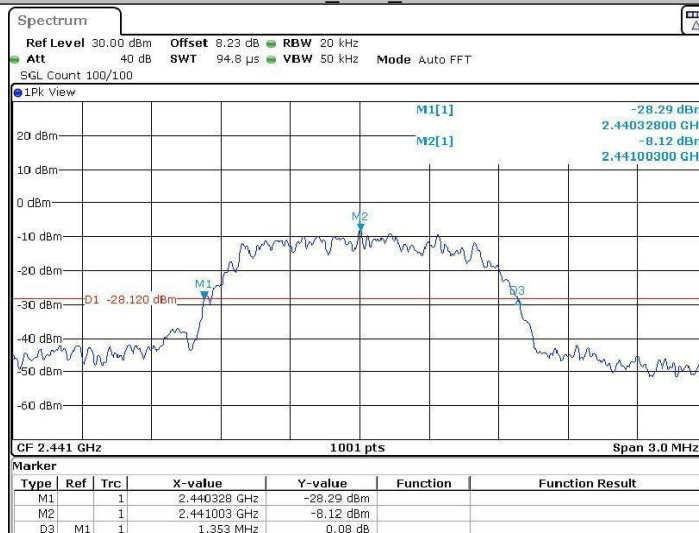
Date: 18.AUG.2022 10:40:29

3DH5\_Ant2\_2402



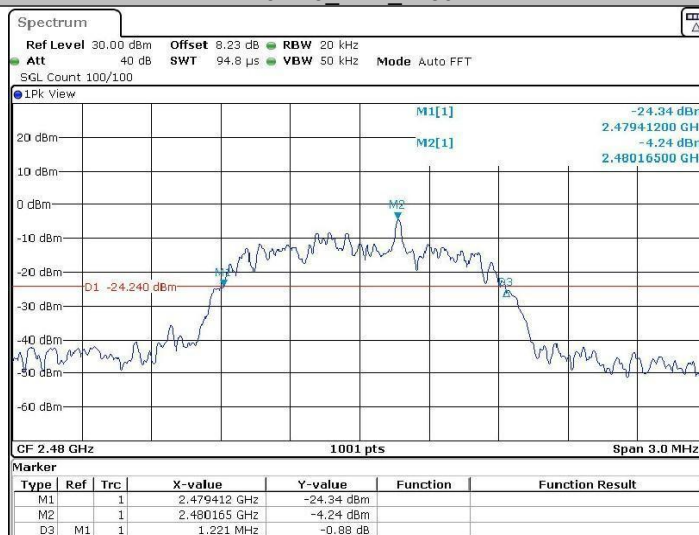
Date: 18.AUG.2022 10:43:19

3DH5\_Ant2\_2441



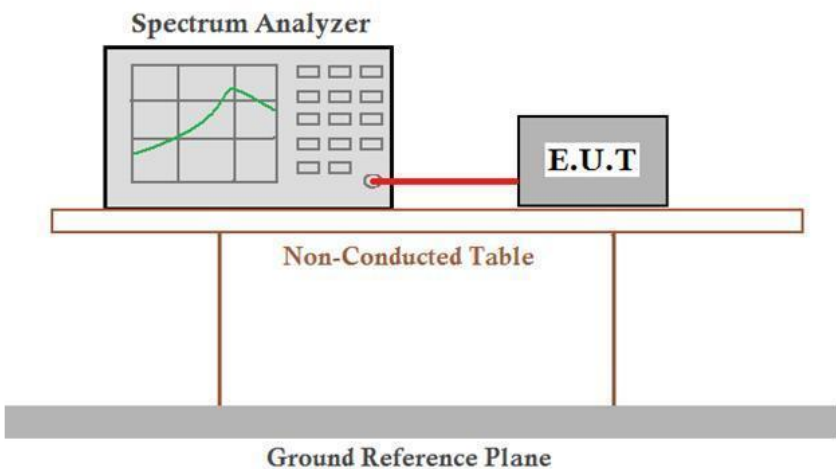
Date: 18.AUG.2022 10:46:30

3DH5\_Ant2\_2480



Date: 18.AUG.2022 10:48:32

## 5.5 Carrier Frequencies Separation

|                        |                                                                                                                                                                                                                                                                                |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement:      | 47 CFR Part 15C Section 15.247 (a)(1)                                                                                                                                                                                                                                          |
| Test Method:           | ANSI C63.10:2013                                                                                                                                                                                                                                                               |
| Test Setup:            |  <p>Remark: Offset=Cable loss+ attenuation factor.</p>                                                                                                                                       |
| Limit:                 | 2/3 of the 20dB bandwidth                                                                                                                                                                                                                                                      |
|                        | Remark: the transmission power is less than 0.125W.                                                                                                                                                                                                                            |
| Exploratory Test Mode: | Hopping transmitting with all kind of modulation and all kind of data type                                                                                                                                                                                                     |
| Final Test Mode:       | Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.<br>Only the worst case is recorded in the report. |
| Test Results:          | Pass                                                                                                                                                                                                                                                                           |

## Measurement Data

### Ant1:

| TestMode | Antenna | Channel | Result[MHz] | Limit[MHz] | Verdict |
|----------|---------|---------|-------------|------------|---------|
| DH5      | Ant1    | Hop     | 0.867       | ≥0.688     | PASS    |
| 2DH5     | Ant1    | Hop     | 1.003       | ≥0.900     | PASS    |
| 3DH5     | Ant1    | Hop     | 1.148       | ≥0.874     | PASS    |

| Mode          | 20dB bandwidth (MHz)<br>(worse case) | Limit (MHz)<br>(Carrier Frequencies Separation) |
|---------------|--------------------------------------|-------------------------------------------------|
| GFSK          | 1.032                                | 0.688                                           |
| $\pi/4$ DQPSK | 1.350                                | 0.900                                           |
| 8DPSK         | 1.311                                | 0.874                                           |

### Ant2:

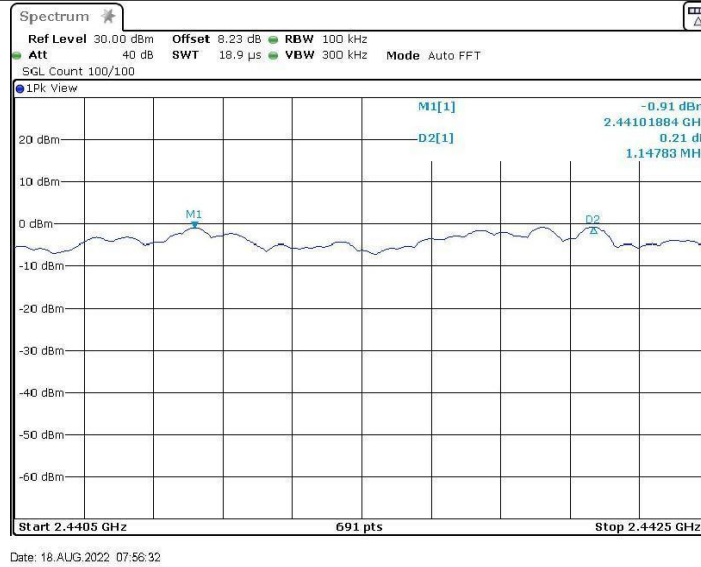
| TestMode | Antenna | Channel | Result[MHz] | Limit[MHz] | Verdict |
|----------|---------|---------|-------------|------------|---------|
| DH5      | Ant2    | Hop     | 1.162       | ≥0.63      | PASS    |
| 2DH5     | Ant2    | Hop     | 1.006       | ≥0.900     | PASS    |
| 3DH5     | Ant2    | Hop     | 1.168       | ≥0.908     | PASS    |

| Mode          | 20dB bandwidth (MHz)<br>(worse case) | Limit (MHz)<br>(Carrier Frequencies Separation) |
|---------------|--------------------------------------|-------------------------------------------------|
| GFSK          | 0.945                                | 0.63                                            |
| $\pi/4$ DQPSK | 1.338                                | 0.9                                             |
| 8DPSK         | 1.362                                | 0.908                                           |

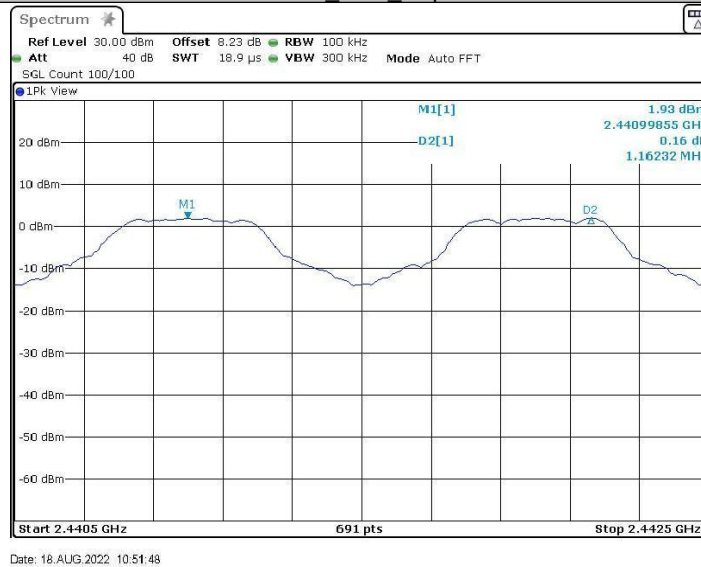
Test plot as follows:



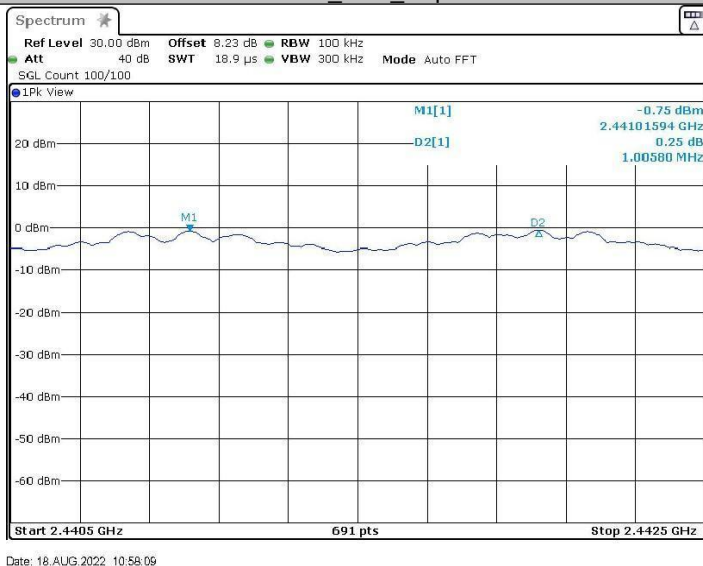
### 3DH5\_Ant1\_Hop



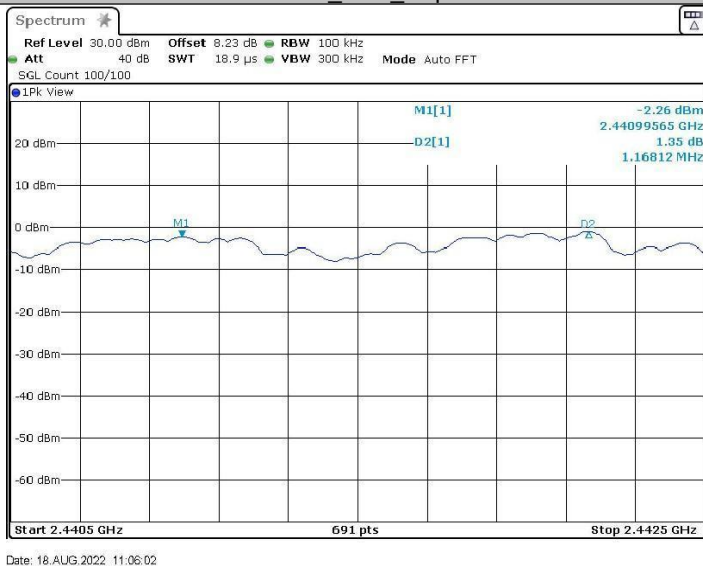
### DH5\_Ant2\_Hop



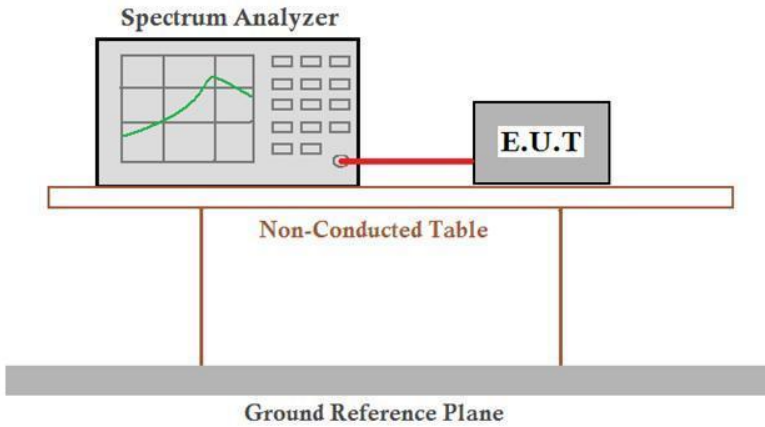
### 2DH5\_Ant2\_Hop



### 3DH5\_Ant2\_Hop



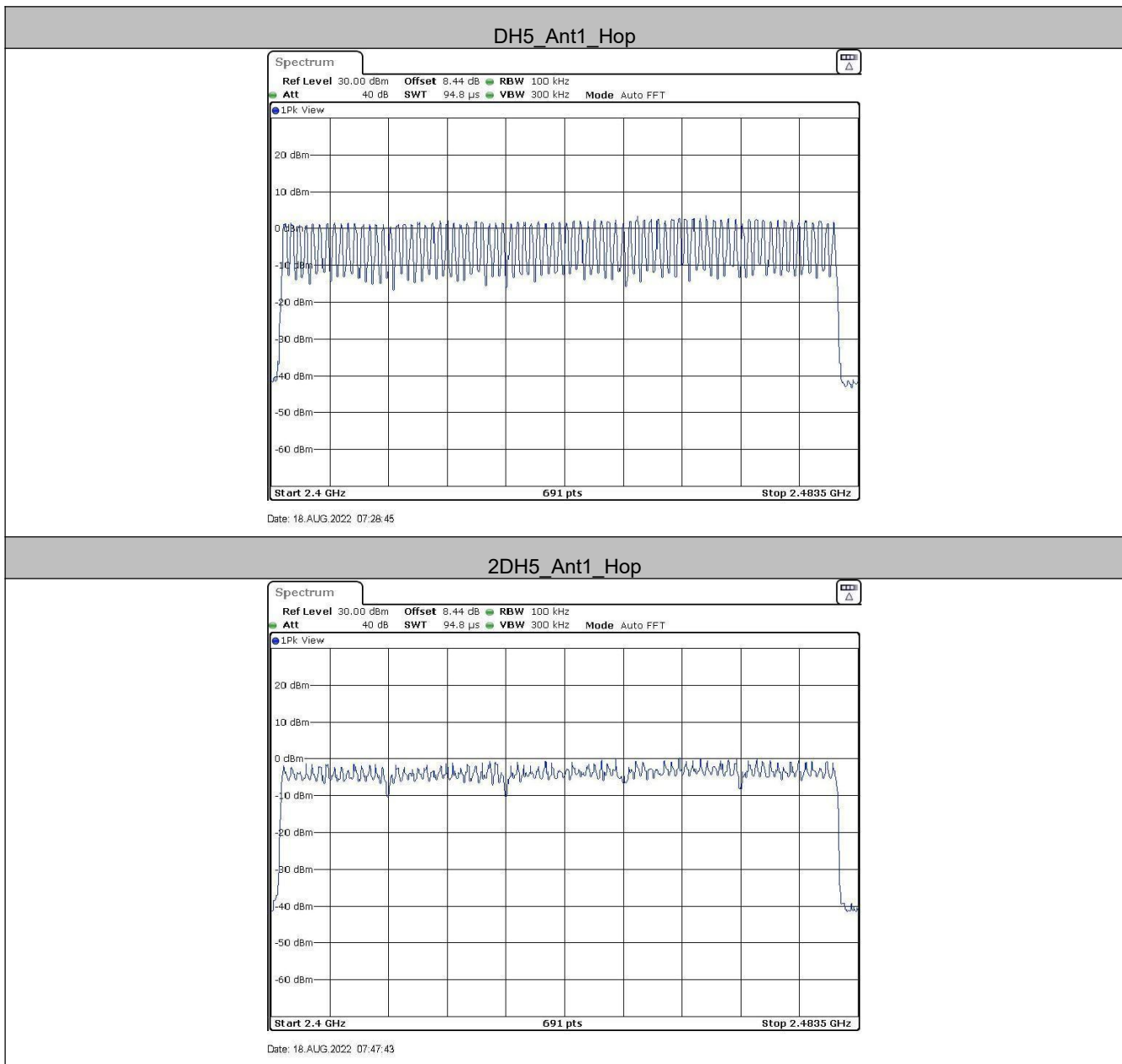
## 5.6 Hopping Channel Number

|                        |                                                                                                                                                                                                                                                                                |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement:      | 47 CFR Part 15C Section 15.247 (a)(1)                                                                                                                                                                                                                                          |
| Test Method:           | ANSI C63.10:2013                                                                                                                                                                                                                                                               |
| Test Setup:            |  <p><i>Remark: Offset=Cable loss+ attenuation factor.</i></p>                                                                                                                                |
| Limit:                 | At least 15 channels                                                                                                                                                                                                                                                           |
| Exploratory Test Mode: | hopping transmitting with all kind of modulation and all kind of data type                                                                                                                                                                                                     |
| Final Test Mode:       | Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.<br>Only the worst case is recorded in the report. |
| Test Results:          | Pass                                                                                                                                                                                                                                                                           |

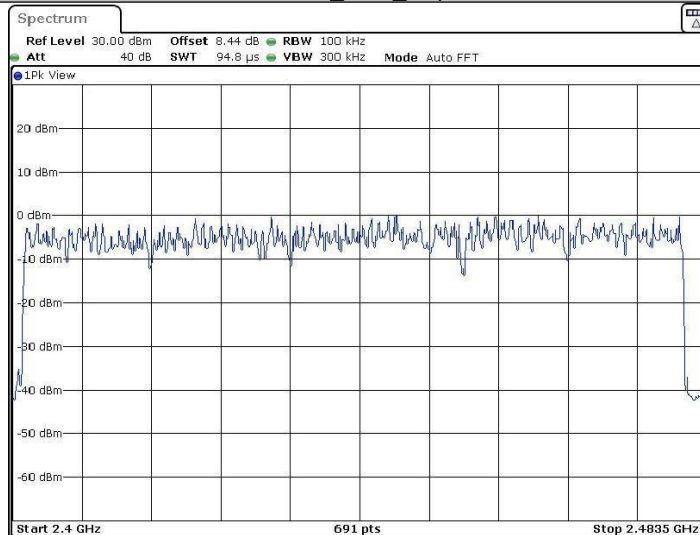
### Measurement Data

| Mode          | Hopping channel numbers | Limit     |
|---------------|-------------------------|-----------|
| GFSK          | 79                      | $\geq 15$ |
| $\pi/4$ DQPSK | 79                      | $\geq 15$ |
| 8DPSK         | 79                      | $\geq 15$ |

Test plot as follows:

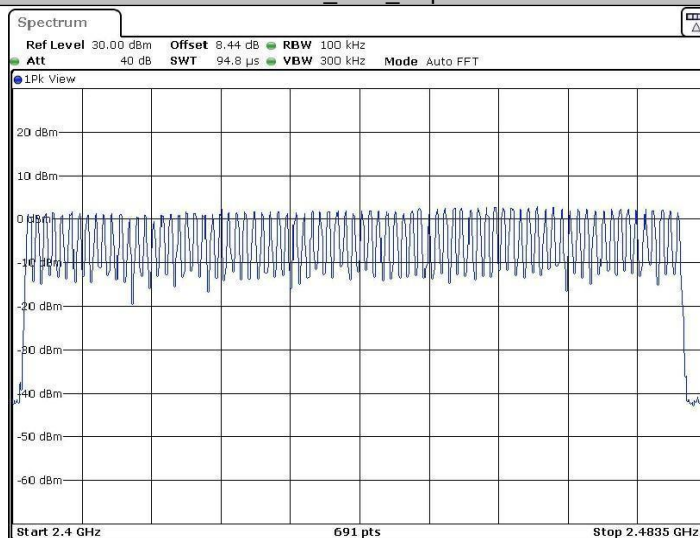


3DH5\_Ant1\_Hop



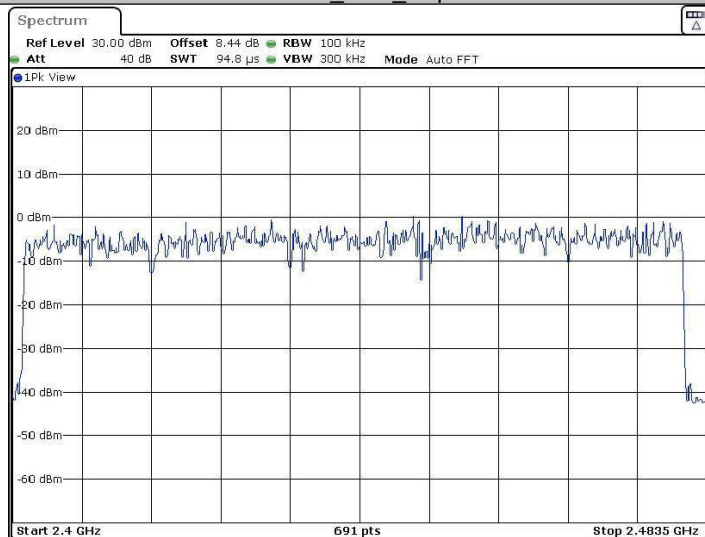
Date: 18.AUG.2022 07:57:04

DH5\_Ant2\_Hop

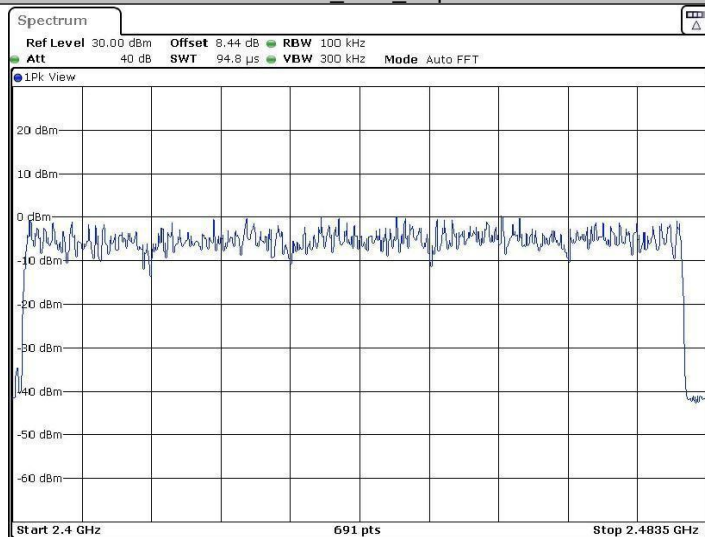


Date: 18.AUG.2022 10:52:06

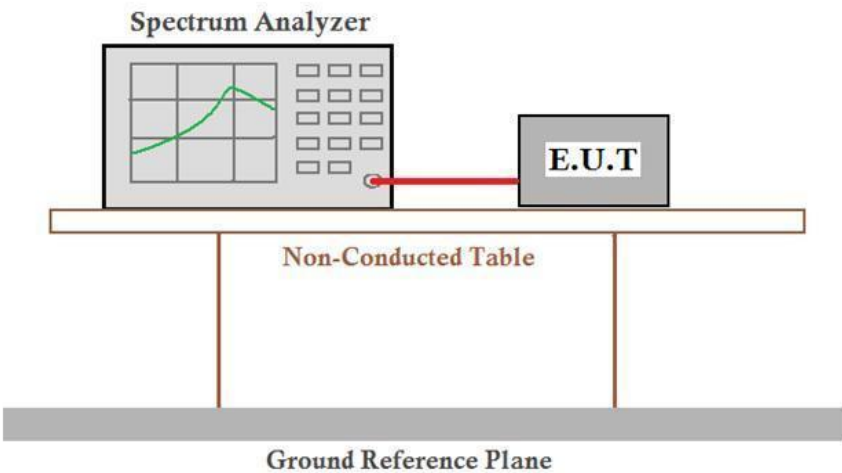
2DH5\_Ant2\_Hop



3DH5\_Ant2\_Hop



## 5.7 Dwell Time

|                   |                                                                                                                                          |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | 47 CFR Part 15C Section 15.247 (a)(1)                                                                                                    |
| Test Method:      | ANSI C63.10:2013                                                                                                                         |
| Test Setup:       |  <p>Remark: Offset=Cable loss+ attenuation factor.</p> |
| Test Mode:        | Hopping transmitting with all kind of modulation and all kind of data type.                                                              |
| Limit:            | 0.4 Second                                                                                                                               |
| Test Results:     | Pass                                                                                                                                     |

## Measurement Data

### Ant1:

| TestMode | Antenna | Channel | BurstWidth<br>[ms] | TotalHops<br>[Num] | Result[s] | Limit[s] | Verdict |
|----------|---------|---------|--------------------|--------------------|-----------|----------|---------|
| DH1      | Ant1    | Hop     | 0.39               | 320                | 0.123     | ≤0.4     | PASS    |
| DH3      | Ant1    | Hop     | 1.63               | 160                | 0.261     | ≤0.4     | PASS    |
| DH5      | Ant1    | Hop     | 2.88               | 130                | 0.374     | ≤0.4     | PASS    |
| 2DH1     | Ant1    | Hop     | 0.39               | 320                | 0.124     | ≤0.4     | PASS    |
| 2DH3     | Ant1    | Hop     | 1.63               | 170                | 0.278     | ≤0.4     | PASS    |
| 2DH5     | Ant1    | Hop     | 2.87               | 130                | 0.373     | ≤0.4     | PASS    |
| 3DH1     | Ant1    | Hop     | 0.39               | 330                | 0.128     | ≤0.4     | PASS    |
| 3DH3     | Ant1    | Hop     | 1.63               | 150                | 0.245     | ≤0.4     | PASS    |
| 3DH5     | Ant1    | Hop     | 2.88               | 110                | 0.316     | ≤0.4     | PASS    |

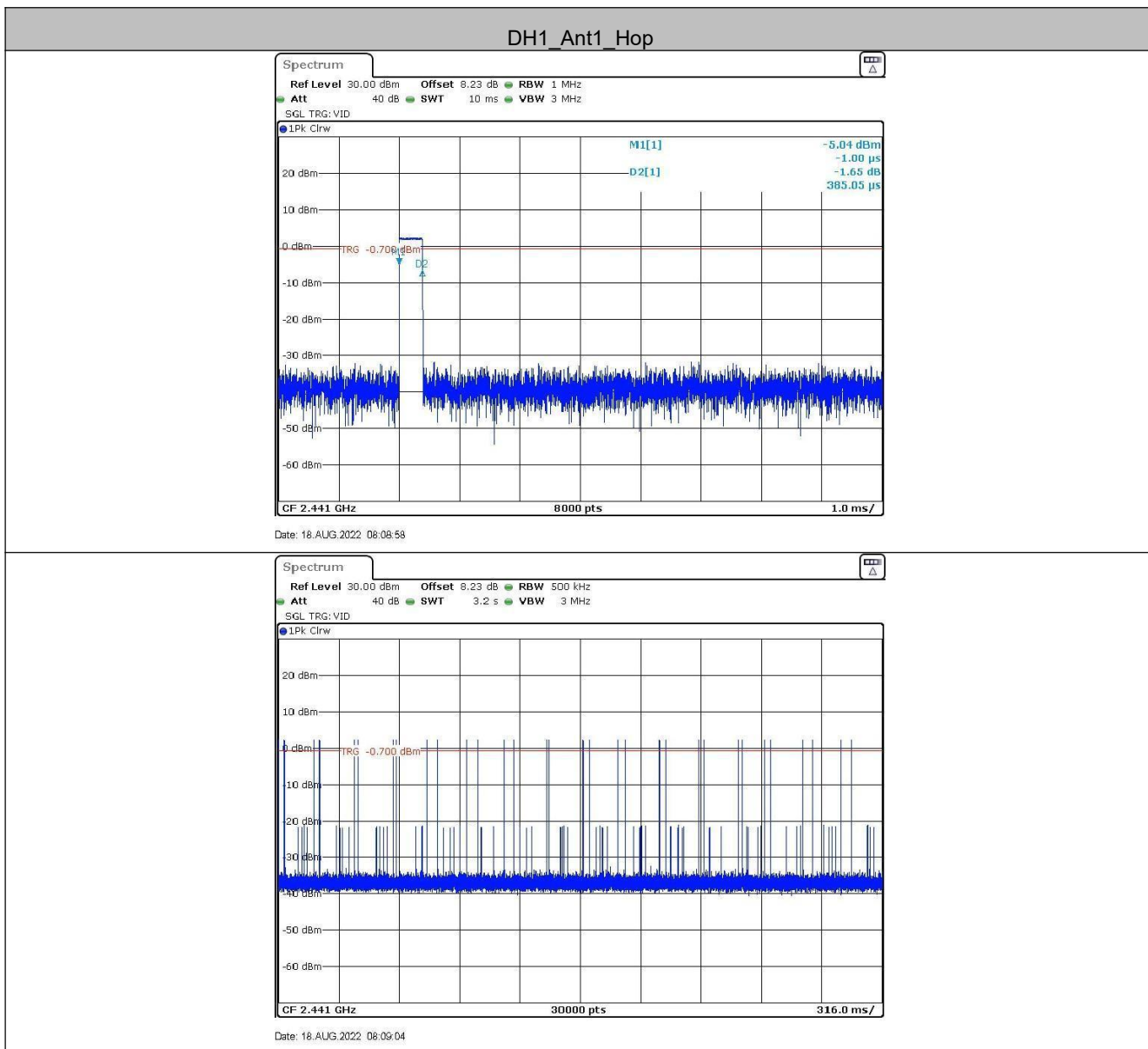
### Ant2:

| TestMode | Antenna | Channel | BurstWidth<br>[ms] | TotalHops<br>[Num] | Result[s] | Limit[s] | Verdict |
|----------|---------|---------|--------------------|--------------------|-----------|----------|---------|
| DH1      | Ant2    | Hop     | 0.39               | 320                | 0.124     | ≤0.4     | PASS    |
| DH3      | Ant2    | Hop     | 1.63               | 180                | 0.294     | ≤0.4     | PASS    |
| DH5      | Ant2    | Hop     | 2.87               | 130                | 0.374     | ≤0.4     | PASS    |
| 2DH1     | Ant2    | Hop     | 0.39               | 330                | 0.128     | ≤0.4     | PASS    |
| 2DH3     | Ant2    | Hop     | 1.63               | 120                | 0.196     | ≤0.4     | PASS    |
| 2DH5     | Ant2    | Hop     | 2.87               | 100                | 0.287     | ≤0.4     | PASS    |
| 3DH1     | Ant2    | Hop     | 0.39               | 80                 | 0.031     | ≤0.4     | PASS    |
| 3DH3     | Ant2    | Hop     | 1.63               | 100                | 0.163     | ≤0.4     | PASS    |
| 3DH5     | Ant2    | Hop     | 2.88               | 130                | 0.374     | ≤0.4     | PASS    |

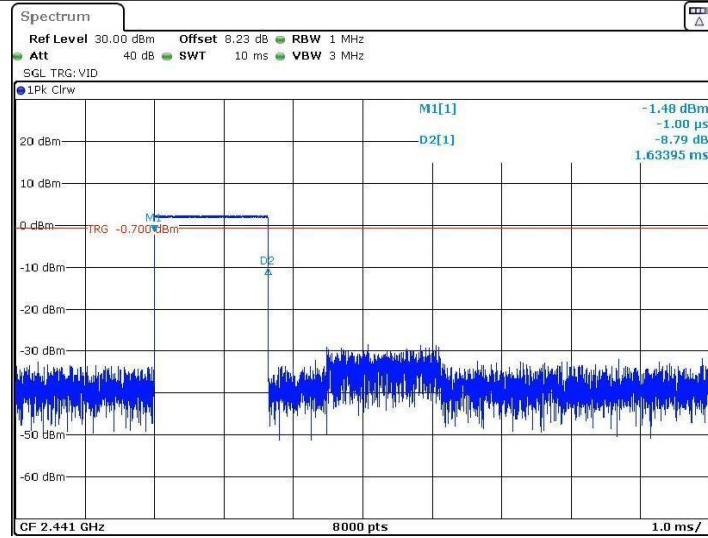
### Remark:

The test period:  $T = 0.4 \text{ Second/Channel} \times 79 \text{ Channel} = 31.6 \text{ s}$

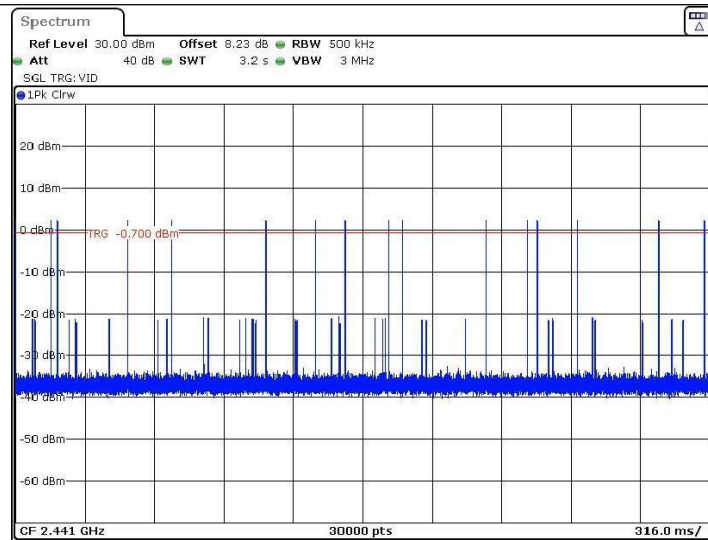
Test plot as follows:



DH3\_Ant1\_Hop

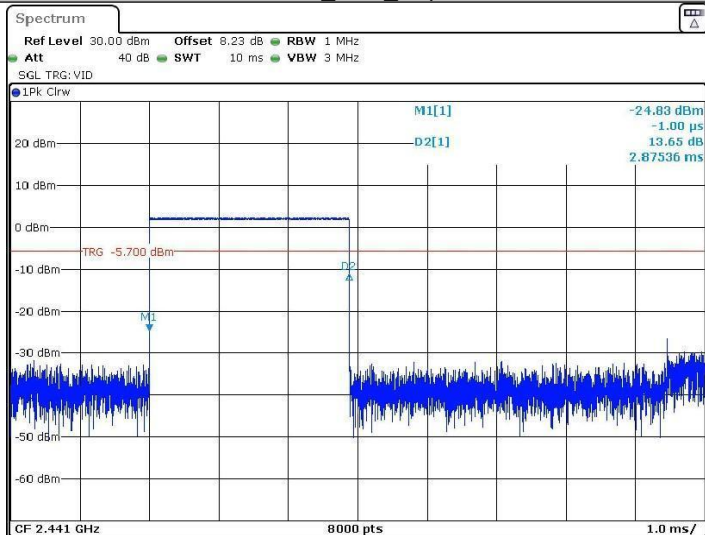


Date: 18.AUG.2022 08:09:35

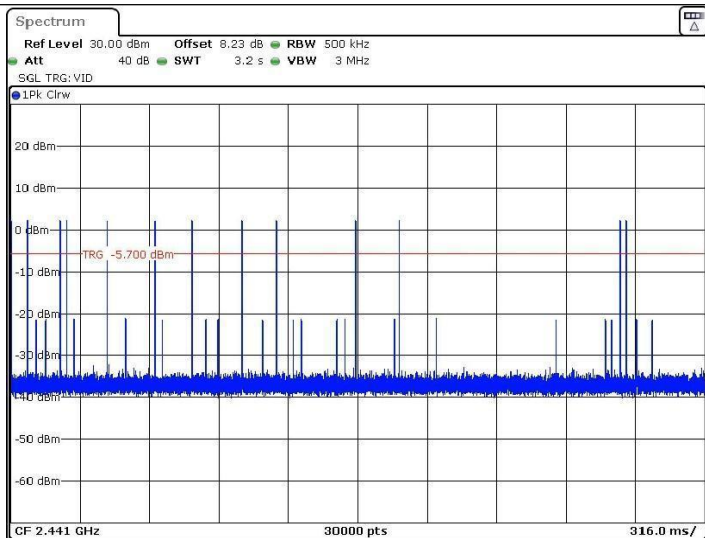


Date: 18.AUG.2022 08:09:41

DH5\_Ant1\_Hop

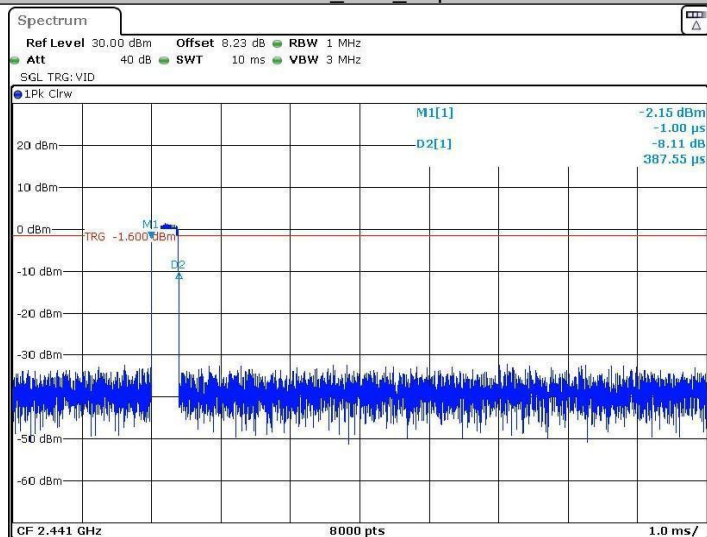


Date: 18.AUG.2022 08:08:18

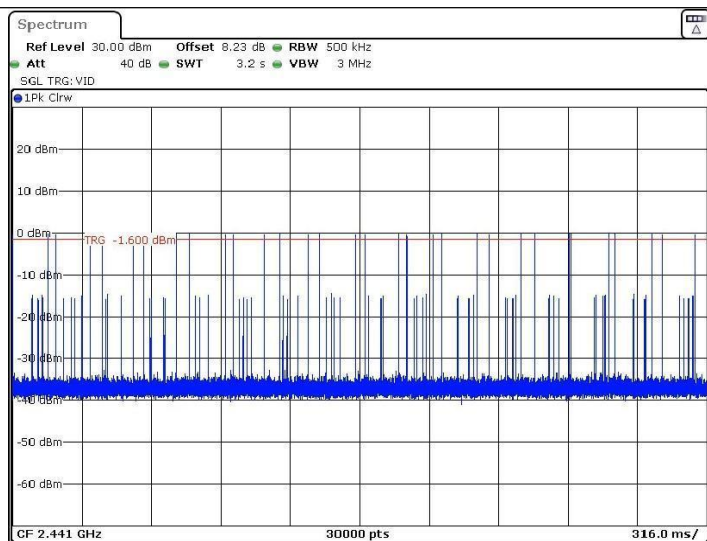


Date: 18.AUG.2022 08:08:24

2DH1\_Ant1\_Hop

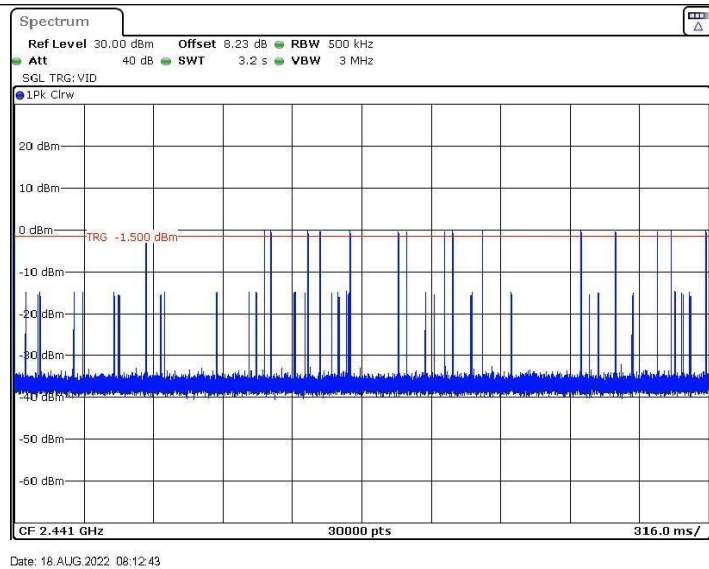
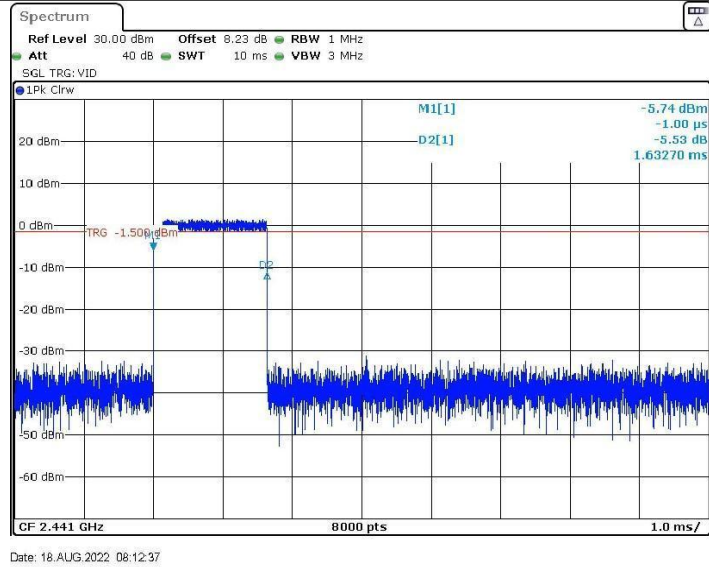


Date: 18.AUG.2022 08:10:49

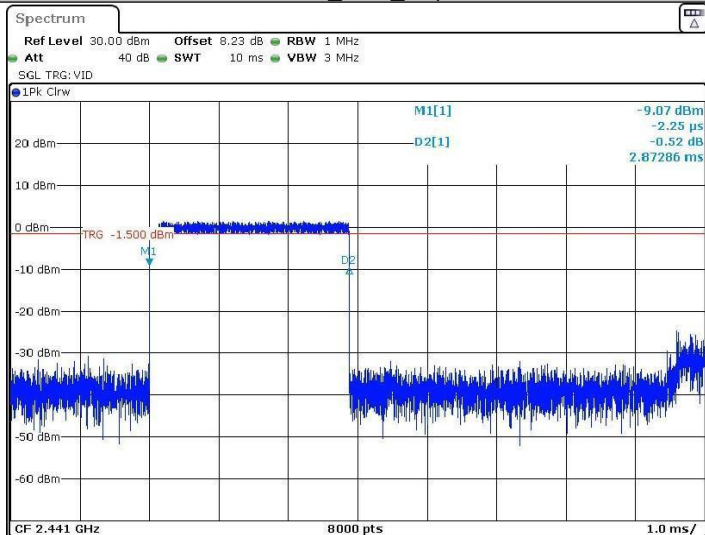


Date: 18.AUG.2022 08:10:55

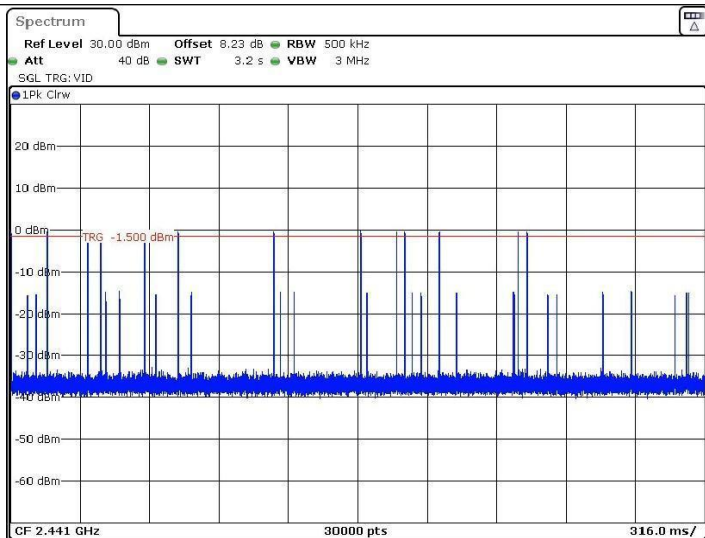
2DH3\_Ant1\_Hop



2DH5\_Ant1\_Hop

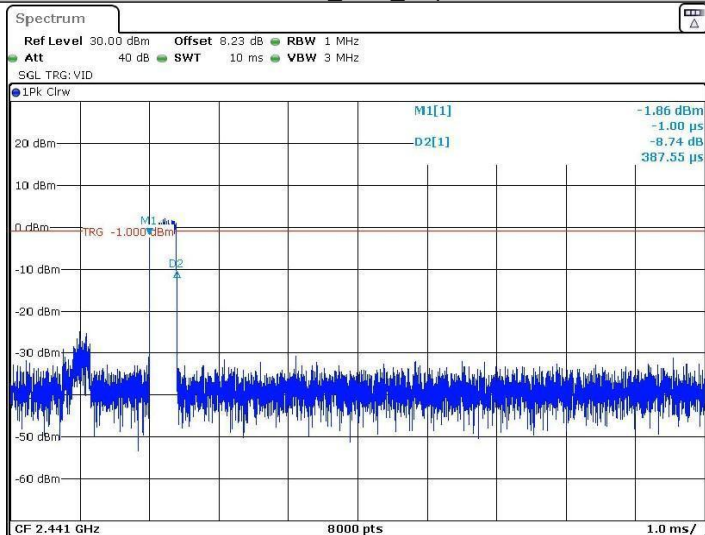


Date: 18.AUG.2022 08:10:14

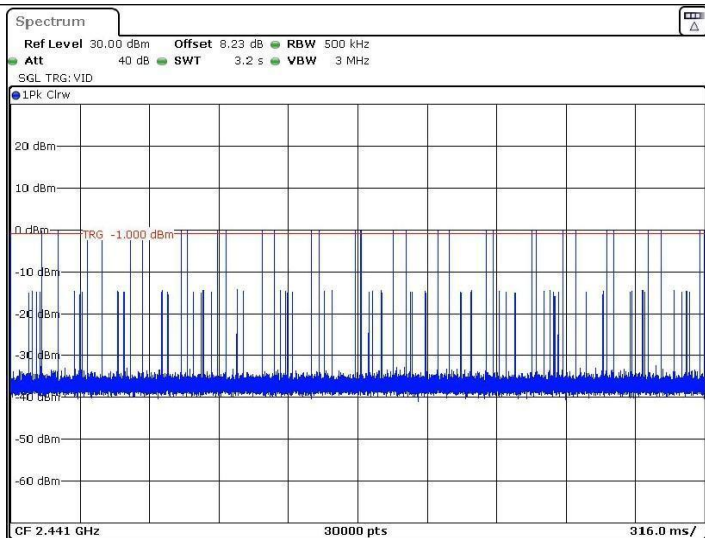


Date: 18.AUG.2022 08:10:20

3DH1\_Ant1\_Hop

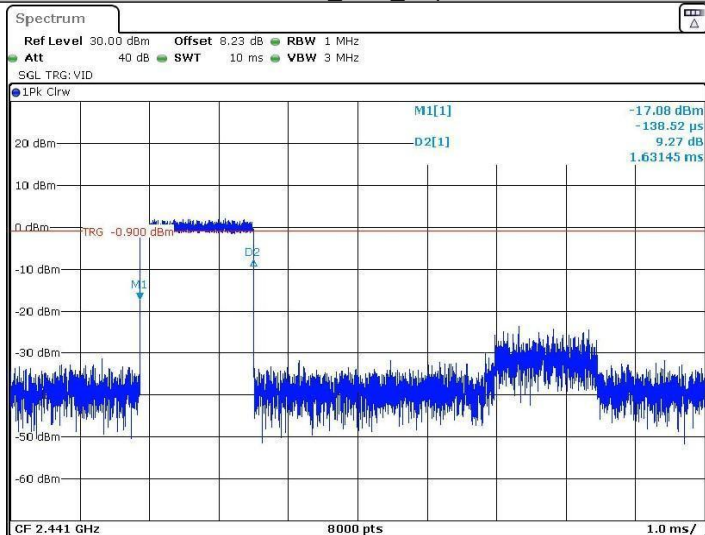


Date: 18.AUG.2022 08:14:33

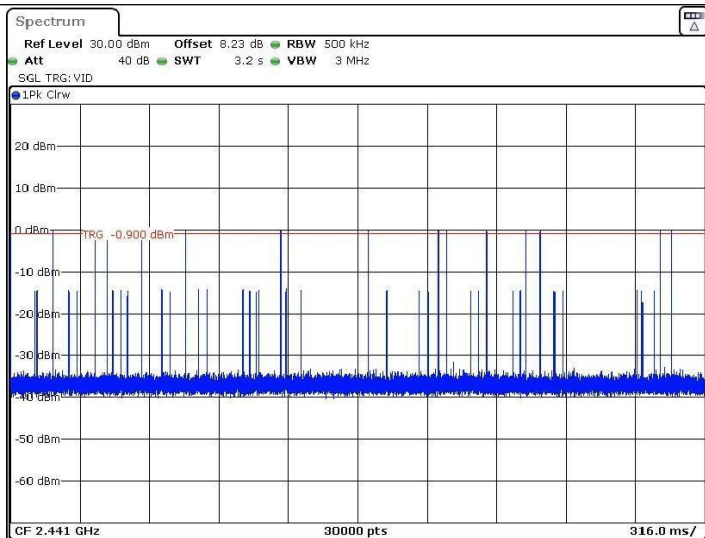


Date: 18.AUG.2022 08:14:39

3DH3\_Ant1\_Hop



Date: 18.AUG.2022 08:15:08



Date: 18.AUG.2022 08:15:14

