

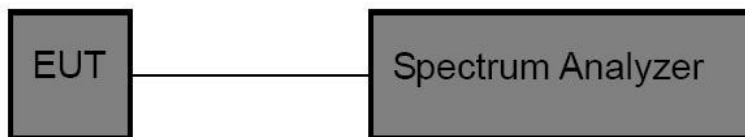


## 9 20DB Occupy Bandwidth Test

### 9.1 Test Standard

|               |                                    |
|---------------|------------------------------------|
| Test Standard | FCC Part15 C Section 15.247 (a)(1) |
|---------------|------------------------------------|

### 9.2 Test Setup



### 9.3 Test Procedure

Using the following spectrum analyzer settings:

1. Span= approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel.
2. Set the RBW = 30 kHz.
3. Set the VBW = 100 kHz.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

### 9.4 Test Data

|              |   |         |             |   |                  |
|--------------|---|---------|-------------|---|------------------|
| Test Item    | : | 20dB BW | Test Mode   | : | CH Low ~ CH High |
| Test Voltage | : | 3.7V    | Temperature | : | 24.5°C           |
| Test Result  | : | PASS    | Humidity    | : | 55%RH            |



L:

| TestMode | Antenna | Frequency[MHz] | 20db<br>EBW[MHz] | FL[MHz]  | FH[MHz]  | Limit[MHz] | Verdict |
|----------|---------|----------------|------------------|----------|----------|------------|---------|
| DH5      | Ant1    | 2402           | 0.951            | 2401.565 | 2402.516 | ---        | ---     |
| DH5      | Ant1    | 2441           | 0.954            | 2440.559 | 2441.513 | ---        | ---     |
| DH5      | Ant1    | 2480           | 0.960            | 2479.559 | 2480.519 | ---        | ---     |
| 2DH5     | Ant1    | 2402           | 1.272            | 2401.400 | 2402.672 | ---        | ---     |
| 2DH5     | Ant1    | 2441           | 1.314            | 2440.370 | 2441.684 | ---        | ---     |
| 2DH5     | Ant1    | 2480           | 1.326            | 2479.358 | 2480.684 | ---        | ---     |
| 3DH5     | Ant1    | 2402           | 1.251            | 2401.397 | 2402.648 | ---        | ---     |
| 3DH5     | Ant1    | 2441           | 1.257            | 2440.394 | 2441.651 | ---        | ---     |
| 3DH5     | Ant1    | 2480           | 1.287            | 2479.385 | 2480.672 | ---        | ---     |

R:

| TestMode | Antenna | Frequency[MHz] | 20db<br>EBW[MHz] | FL[MHz]  | FH[MHz]  | Limit[MHz] | Verdict |
|----------|---------|----------------|------------------|----------|----------|------------|---------|
| DH5      | Ant1    | 2402           | 0.951            | 2401.562 | 2402.513 | ---        | ---     |
| DH5      | Ant1    | 2441           | 0.939            | 2440.571 | 2441.510 | ---        | ---     |
| DH5      | Ant1    | 2480           | 0.945            | 2479.568 | 2480.513 | ---        | ---     |
| 2DH5     | Ant1    | 2402           | 1.272            | 2401.400 | 2402.672 | ---        | ---     |
| 2DH5     | Ant1    | 2441           | 1.362            | 2440.346 | 2441.708 | ---        | ---     |
| 2DH5     | Ant1    | 2480           | 1.353            | 2479.349 | 2480.702 | ---        | ---     |
| 3DH5     | Ant1    | 2402           | 1.245            | 2401.403 | 2402.648 | ---        | ---     |
| 3DH5     | Ant1    | 2441           | 1.296            | 2440.373 | 2441.669 | ---        | ---     |
| 3DH5     | Ant1    | 2480           | 1.272            | 2479.391 | 2480.663 | ---        | ---     |



## Test Graphs:

L:

DH5-Ant1-2402



DH5-Ant1-2441



DH5-Ant1-2480



2DH5-Ant1-2402



2DH5-Ant1-2441



2DH5-Ant1-2480



3DH5-Ant1-2402



3DH5-Ant1-2441



3DH5-Ant1-2480



R:

DH5-Ant1-2402





## DH5-Ant1-2441



## DH5-Ant1-2480



## 2DH5-Ant1-2402



2DH5-Ant1-2441



2DH5-Ant1-2480



3DH5-Ant1-2402



3DH5-Ant1-2441



## 3DH5-Ant1-2480



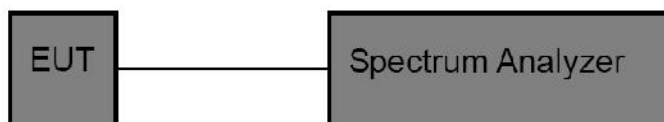


## 10 Carrier Frequency Separation Test

### 10.1 Test Standard and Limit

|               |                                              |
|---------------|----------------------------------------------|
| Test Standard | FCC Part15 C Section 15.247 (a)(1)           |
| Test Limit    | >25KHz or >two-thirds of the 20 dB bandwidth |

### 10.2 Test Setup



### 10.3 Test Procedure

The EUT must have its hopping function enabled. Using the following spectrum analyzer settings:

1. Span= Wide enough to capture the peaks of two adjacent channels
2. Set the RBW = 300 kHz.
3. Set the VBW = 300 kHz.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

### 10.4 Test Data

|              |   |                      |             |   |                  |
|--------------|---|----------------------|-------------|---|------------------|
| Test Item    | : | Frequency Separation | Test Mode   | : | CH Low ~ CH High |
| Test Voltage | : | 3.7V                 | Temperature | : | 24.5°C           |
| Test Result  | : | PASS                 | Humidity    | : | 55%RH            |



L:

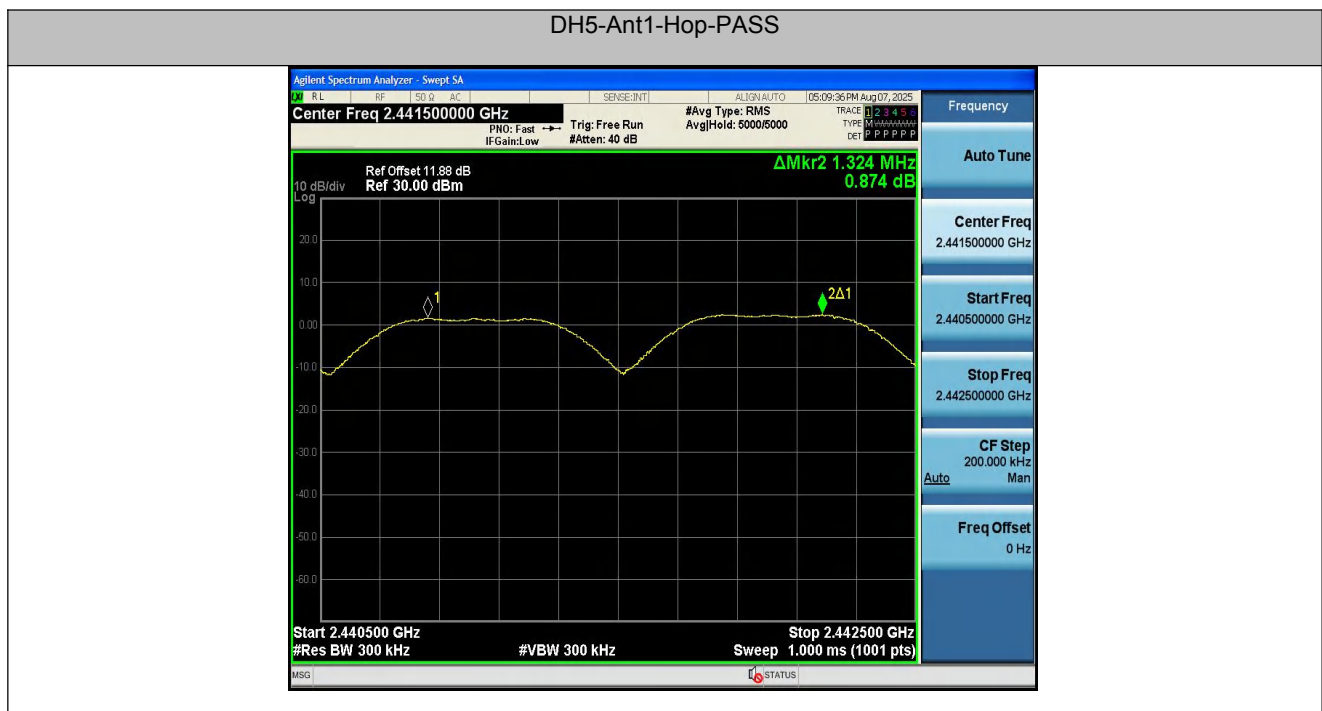
| TestMode | Antenna | Frequency[MHz] | Result[MHz] | Limit[MHz]   | Verdict |
|----------|---------|----------------|-------------|--------------|---------|
| DH5      | Ant1    | Hop            | 1.324       | $\geq 0.640$ | PASS    |
| 2DH5     | Ant1    | Hop            | 1.178       | $\geq 0.884$ | PASS    |
| 3DH5     | Ant1    | Hop            | 0.990       | $\geq 0.858$ | PASS    |

R:

| TestMode | Antenna | Frequency[MHz] | Result[MHz] | Limit[MHz]   | Verdict |
|----------|---------|----------------|-------------|--------------|---------|
| DH5      | Ant1    | Hop            | 0.644       | $\geq 0.634$ | PASS    |
| 2DH5     | Ant1    | Hop            | 1.022       | $\geq 0.908$ | PASS    |
| 3DH5     | Ant1    | Hop            | 1.318       | $\geq 0.864$ | PASS    |

## Test Graphs:

L:





## 2DH5-Ant1-Hop-PASS



## 3DH5-Ant1-Hop-PASS





R:

DH5-Ant1-Hop-PASS



2DH5-Ant1-Hop-PASS



3DH5-Ant1-Hop-PASS



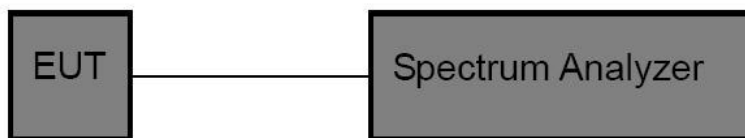


## 11 Number of Hopping Channel Test

### 11.1 Test Standard and Limit

|               |                                    |
|---------------|------------------------------------|
| Test Standard | FCC Part15 C Section 15.247 (a)(1) |
| Test Limit    | >15 channels                       |

### 11.2 Test Setup



### 11.3 Test Procedure

The EUT must have its hopping function enabled. Using the following spectrum analyzer setting:

1. Span= the frequency band of operation
2. Set the RBW = 300kHz.
3. Set the VBW = 300kHz.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.



## 11.4 Test Data

|              |                               |             |                    |
|--------------|-------------------------------|-------------|--------------------|
| Test Item    | : Number of Hopping Frequency | Test Mode   | : CH Low ~ CH High |
| Test Voltage | : 3.7V                        | Temperature | : 24.5°C           |
| Test Result  | : PASS                        | Humidity    | : 55%RH            |

L:

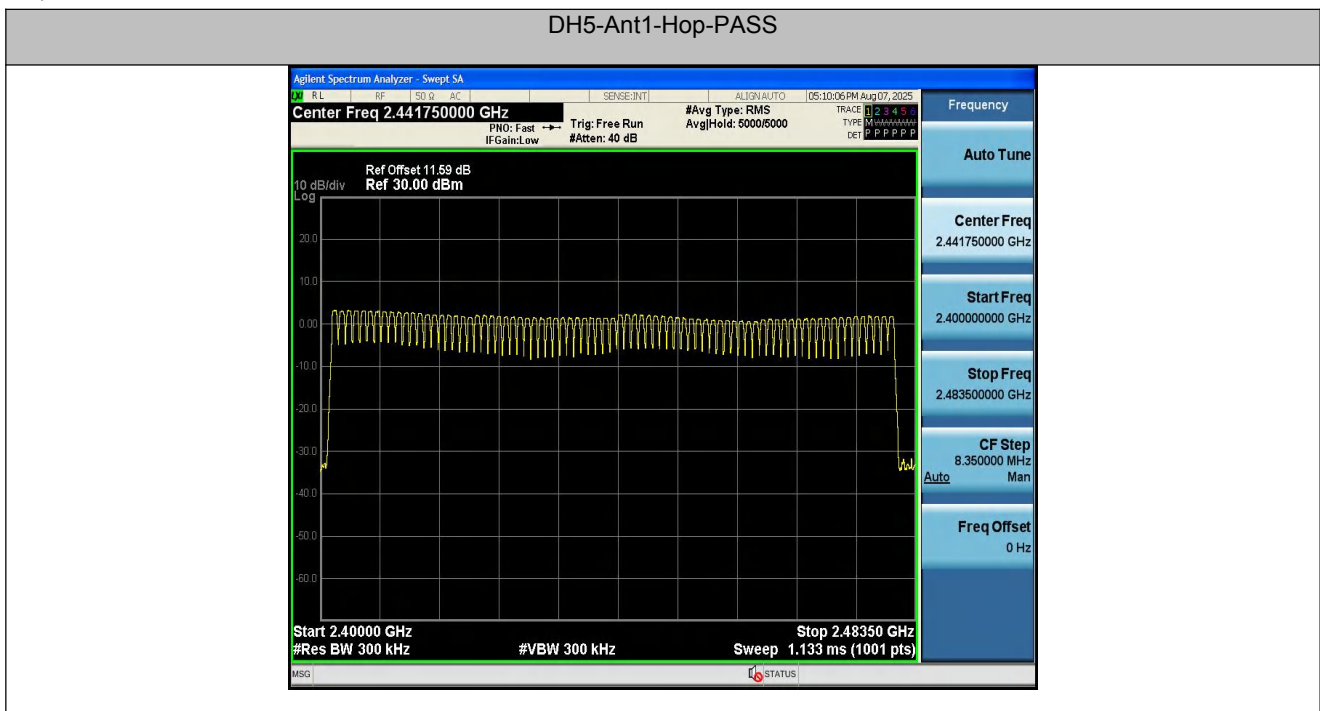
| TestMode | Antenna | Frequency[MHz] | Result[Num] | Limit[Num] | Verdict |
|----------|---------|----------------|-------------|------------|---------|
| DH5      | Ant1    | Hop            | 79          | ≥15        | PASS    |
| 2DH5     | Ant1    | Hop            | 79          | ≥15        | PASS    |
| 3DH5     | Ant1    | Hop            | 79          | ≥15        | PASS    |

R:

| TestMode | Antenna | Frequency[MHz] | Result[Num] | Limit[Num] | Verdict |
|----------|---------|----------------|-------------|------------|---------|
| DH5      | Ant1    | Hop            | 79          | ≥15        | PASS    |
| 2DH5     | Ant1    | Hop            | 79          | ≥15        | PASS    |
| 3DH5     | Ant1    | Hop            | 79          | ≥15        | PASS    |

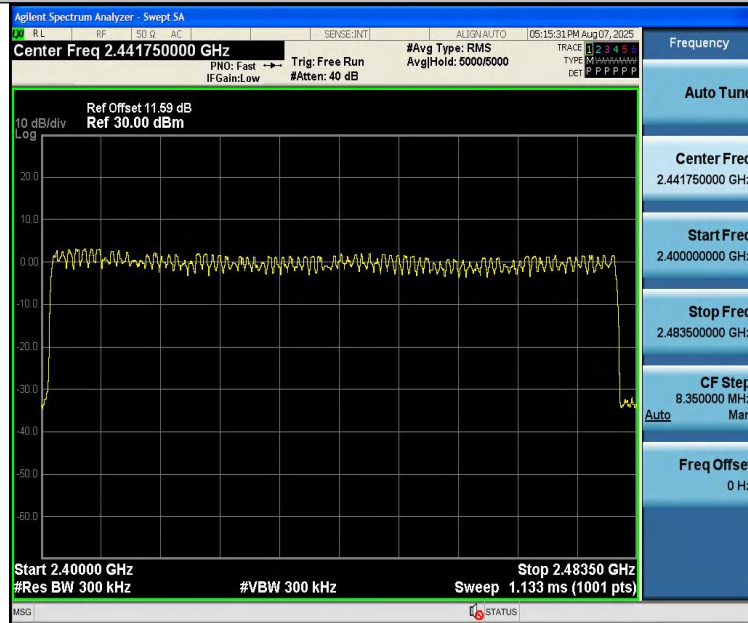
## Test Graphs:

L:

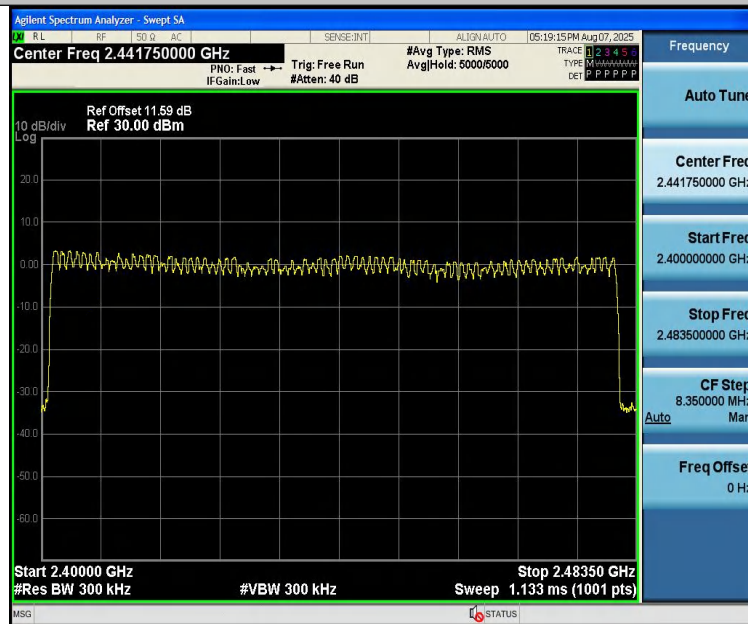




### 2DH5-Ant1-Hop-PASS



### 3DH5-Ant1-Hop-PASS





R:

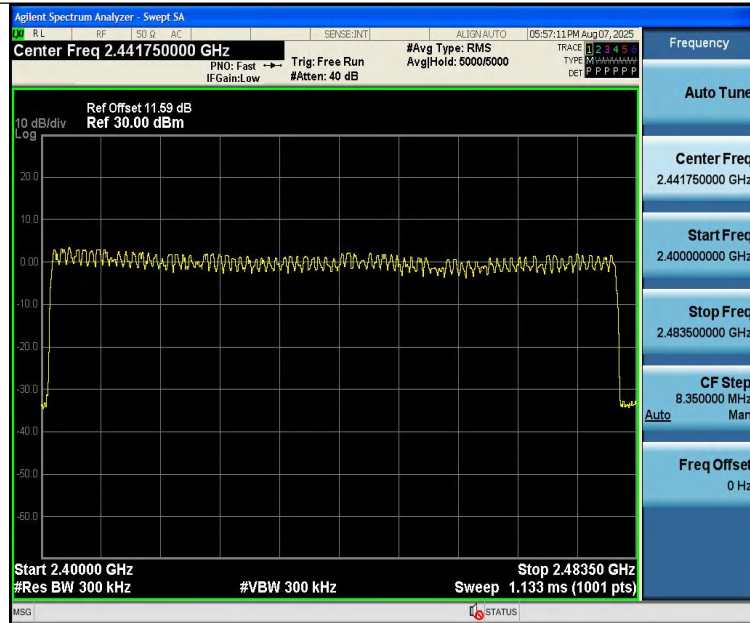
DH5-Ant1-Hop-PASS



2DH5-Ant1-Hop-PASS



3DH5-Ant1-Hop-PASS



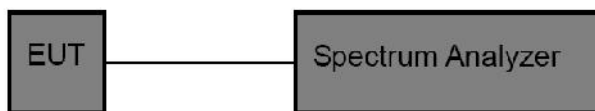


## 12 Dwell Time Test

### 12.1 Test Standard and Limit

|               |                                    |
|---------------|------------------------------------|
| Test Standard | FCC Part15 C Section 15.247 (a)(1) |
| Test Limit    | 0.4 sec                            |

### 12.2 Test Setup



### 12.3 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span= zero span, centered on a hopping channel
2. Set the RBW = 1 MHz.
3. Set the VBW = 3 MHz.
4. Sweep time = as necessary to capture the entire dwell time per hopping channel.
5. Detector function = peak.
6. Trace mode = clear write.
7. Allow trace to fully stabilize.



## 12.4 Test Data

Test Item : Time of Occupancy  
Test Voltage : 3.7V  
Test Result : PASS

Test Mode : CH Low ~ CH High  
Temperature : 24.5°C  
Humidity : 55%RH

L:

| TestMode | Antenna | Frequency[MHz] | BurstWidth [ms] | TotalHops [Num] | Result[s] | Limit[s] | Verdict |
|----------|---------|----------------|-----------------|-----------------|-----------|----------|---------|
| DH5      | Ant1    | Hop            | 2.908           | 106.67          | 0.310     | ≤0.4     | PASS    |
| 2DH5     | Ant1    | Hop            | 2.916           | 106.67          | 0.311     | ≤0.4     | PASS    |
| 3DH5     | Ant1    | Hop            | 2.917           | 106.67          | 0.311     | ≤0.4     | PASS    |
| DH1      | Ant1    | Hop            | 0.405           | 320             | 0.130     | ≤0.4     | PASS    |
| 2DH1     | Ant1    | Hop            | 0.415           | 320             | 0.133     | ≤0.4     | PASS    |
| 3DH1     | Ant1    | Hop            | 0.417           | 320             | 0.133     | ≤0.4     | PASS    |
| DH3      | Ant1    | Hop            | 1.661           | 160             | 0.266     | ≤0.4     | PASS    |
| 2DH3     | Ant1    | Hop            | 1.667           | 160             | 0.267     | ≤0.4     | PASS    |
| 3DH3     | Ant1    | Hop            | 1.667           | 160             | 0.267     | ≤0.4     | PASS    |

R:

| TestMode | Antenna | Frequency[MHz] | BurstWidth [ms] | TotalHops [Num] | Result[s] | Limit[s] | Verdict |
|----------|---------|----------------|-----------------|-----------------|-----------|----------|---------|
| DH5      | Ant1    | Hop            | 2.910           | 106.67          | 0.310     | ≤0.4     | PASS    |
| 2DH5     | Ant1    | Hop            | 2.915           | 106.67          | 0.311     | ≤0.4     | PASS    |
| 3DH5     | Ant1    | Hop            | 2.917           | 106.67          | 0.311     | ≤0.4     | PASS    |
| DH1      | Ant1    | Hop            | 0.405           | 320             | 0.130     | ≤0.4     | PASS    |
| 2DH1     | Ant1    | Hop            | 0.414           | 320             | 0.132     | ≤0.4     | PASS    |
| 3DH1     | Ant1    | Hop            | 0.417           | 320             | 0.133     | ≤0.4     | PASS    |
| DH3      | Ant1    | Hop            | 1.661           | 160             | 0.266     | ≤0.4     | PASS    |
| 2DH3     | Ant1    | Hop            | 1.667           | 160             | 0.267     | ≤0.4     | PASS    |
| 3DH3     | Ant1    | Hop            | 1.667           | 160             | 0.267     | ≤0.4     | PASS    |

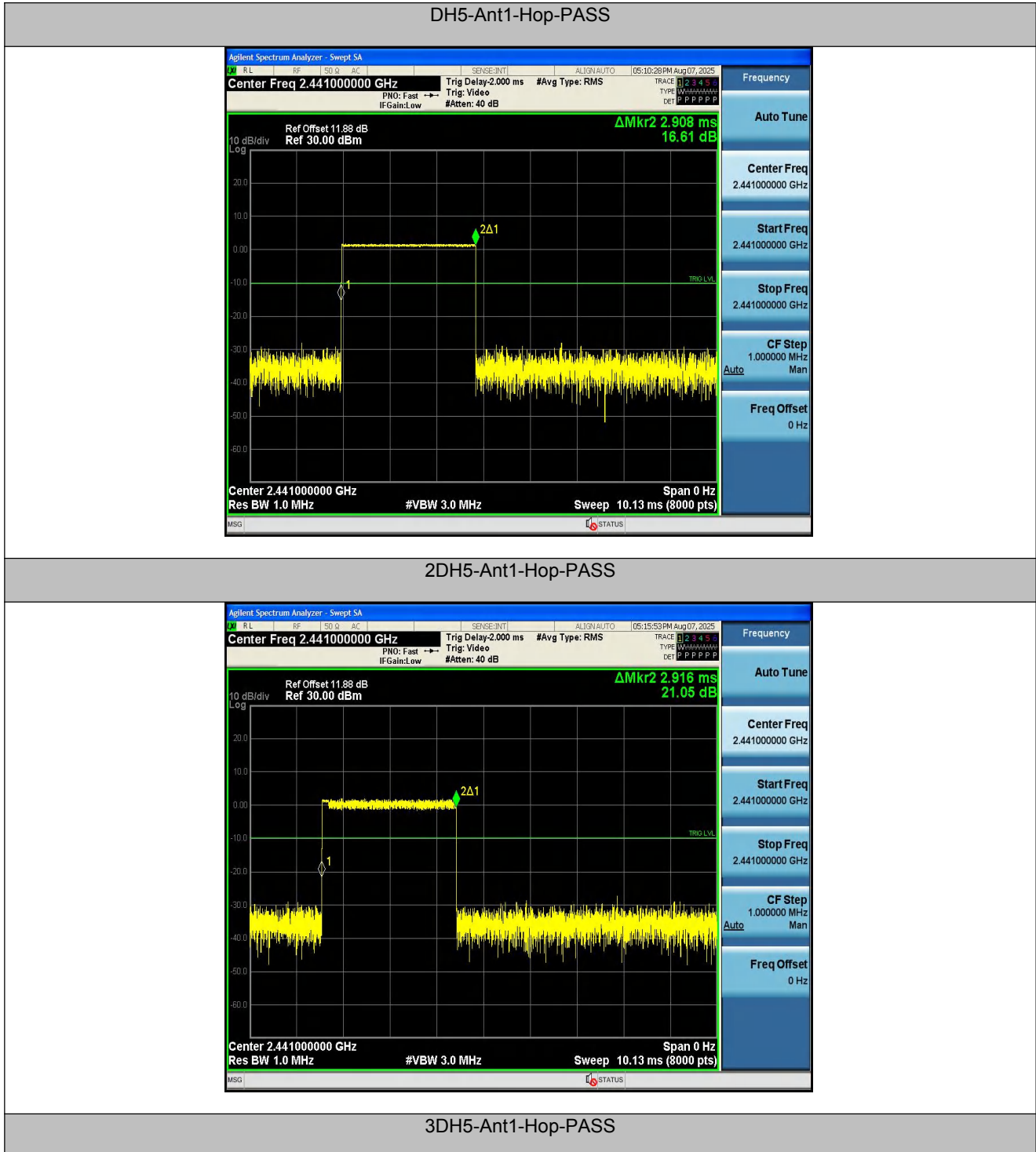
Note:

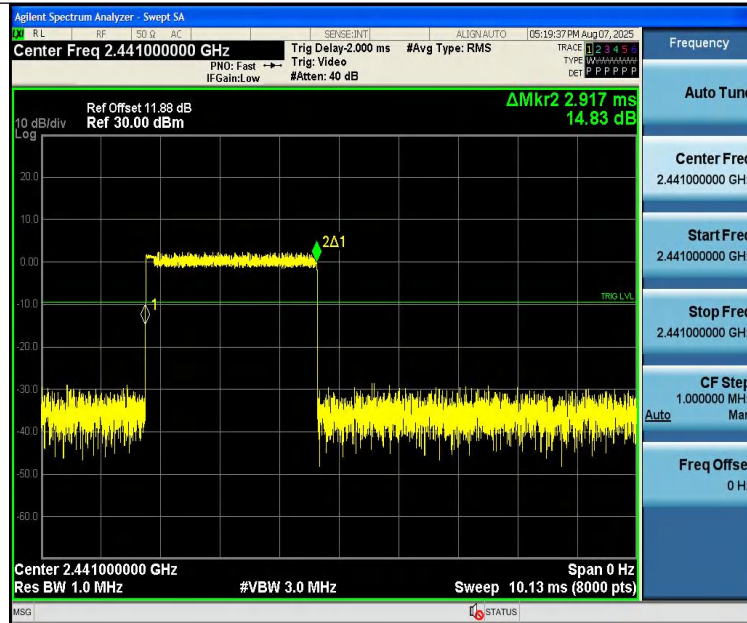
- 1.DH1/2DH1/3DH1 Dwell Time: Reading \* (1600/2)\*31.6/(channel number).
- 2.DH3/2DH3/3DH3 Dwell Time: Reading \* (1600/4)\*31.6/(channel number).
- 3.DH5/2DH5/3DH5 Dwell Time: Reading \* (1600/6)\*31.6/(channel number).



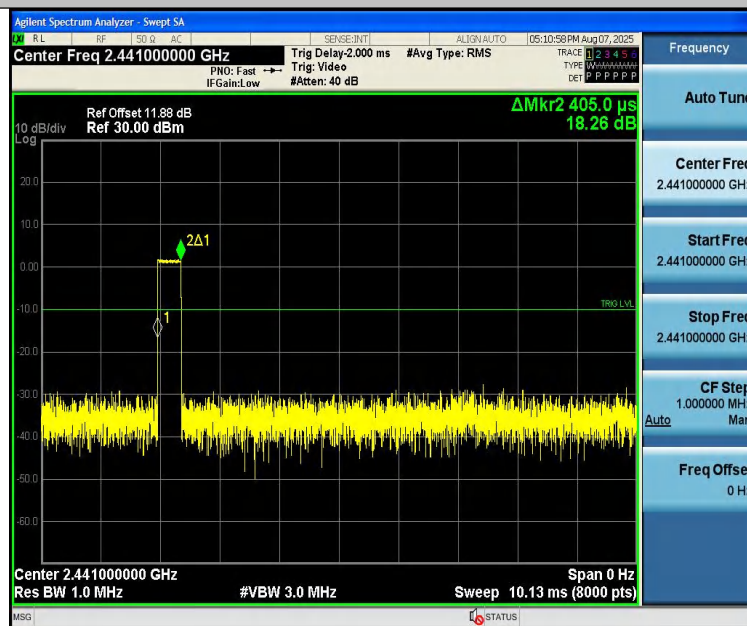
## Test Graphs:

L:

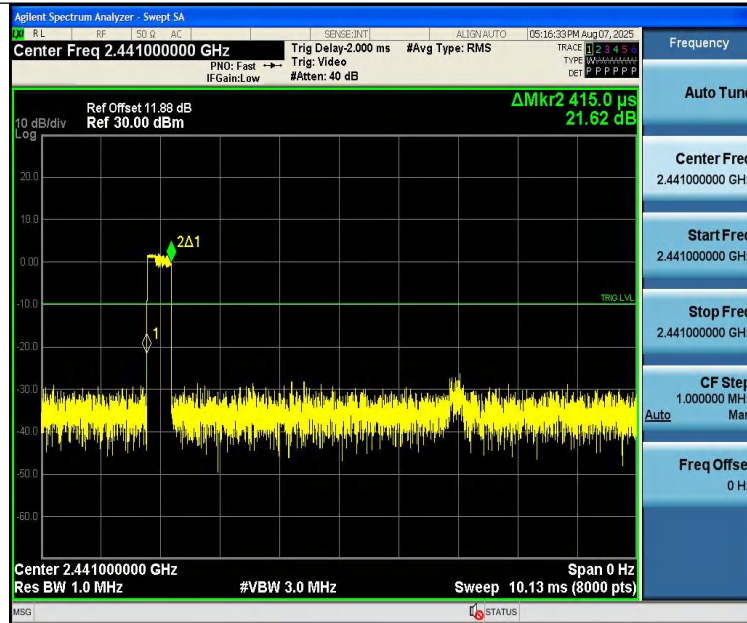




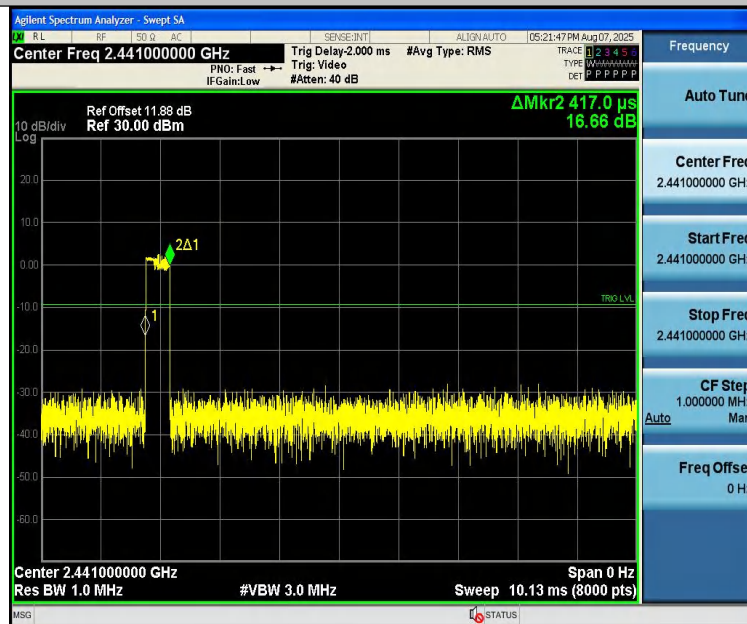
DH1-Ant1-Hop-PASS



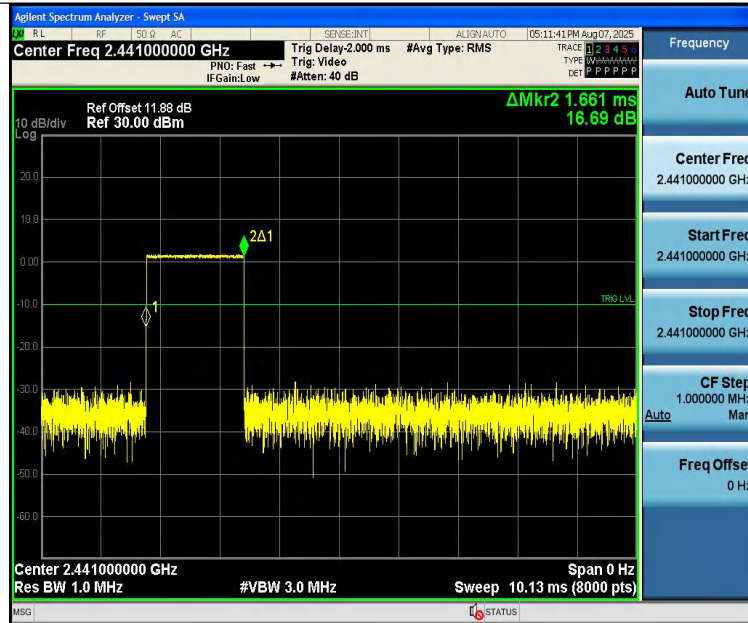
2DH1-Ant1-Hop-PASS



3DH1-Ant1-Hop-PASS



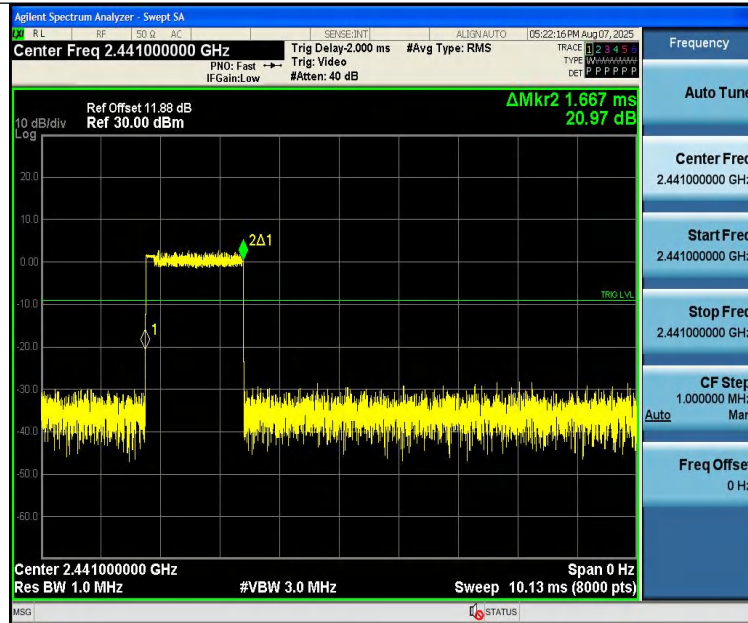
DH3-Ant1-Hop-PASS



2DH3-Ant1-Hop-PASS



3DH3-Ant1-Hop-PASS



R:

DH5-Ant1-Hop-PASS

