# Appendix A

## RF Test Data for BT (Conducted Measurement)

**Product Name: Handheld Controller**

**Test Model: iHand55**

**Environmental Conditions**

| | |
|---|---|
| Temperature: | 23.8° C |
| Relative Humidity: | 52.1% |
| ATM Pressure: | 100.0 kPa |
| Test Engineer: | Taylor Hu |
| | Nick Peng |
| Supervised by: | Ling Zhu |
| | Ling. Zhu |

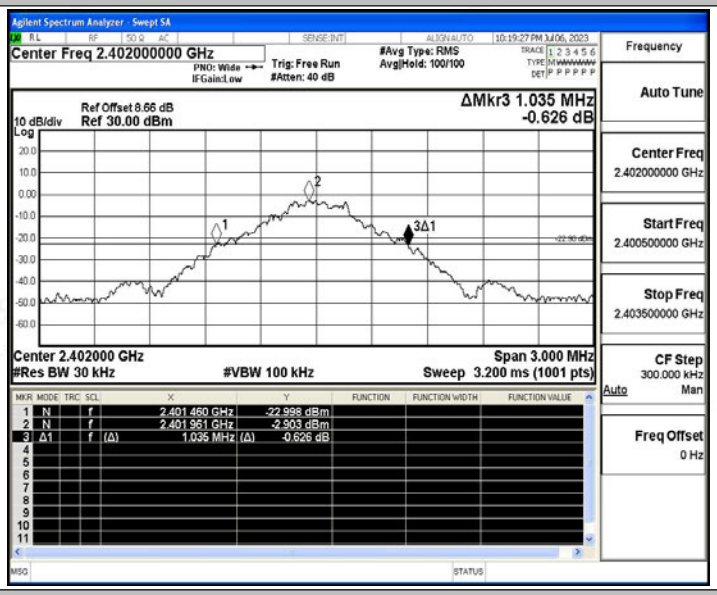
# A.1 20dB Emission Bandwidth

## Test Result

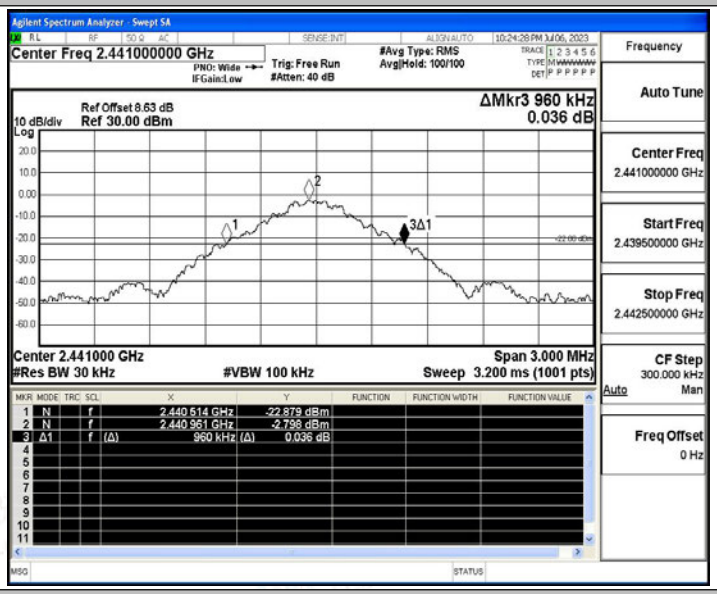
| TestMode | Antenna | Frequency[MHz] | 20db EBW[MHz] | FL[MHz] | FH[MHz] | Limit[MHz] | Verdict |
|---|---|---|---|---|---|---|---|
| DH5 | Ant1 | 2402 | 1.035 | 2401.460 | 2402.495 | --- | --- |
| | | 2441 | 0.960 | 2440.514 | 2441.474 | --- | --- |
| | | 2480 | 0.966 | 2479.514 | 2480.480 | --- | --- |
| 2DH5 | Ant1 | 2402 | 1.284 | 2401.352 | 2402.636 | --- | --- |
| | | 2441 | 1.293 | 2440.349 | 2441.642 | --- | --- |
| | | 2480 | 1.326 | 2479.322 | 2480.648 | --- | --- |
| 3DH5 | Ant1 | 2402 | 1.317 | 2401.328 | 2402.645 | --- | --- |
| | | 2441 | 1.308 | 2440.340 | 2441.648 | --- | --- |
| | | 2480 | 1.308 | 2479.337 | 2480.645 | --- | --- |

## Test Graphs

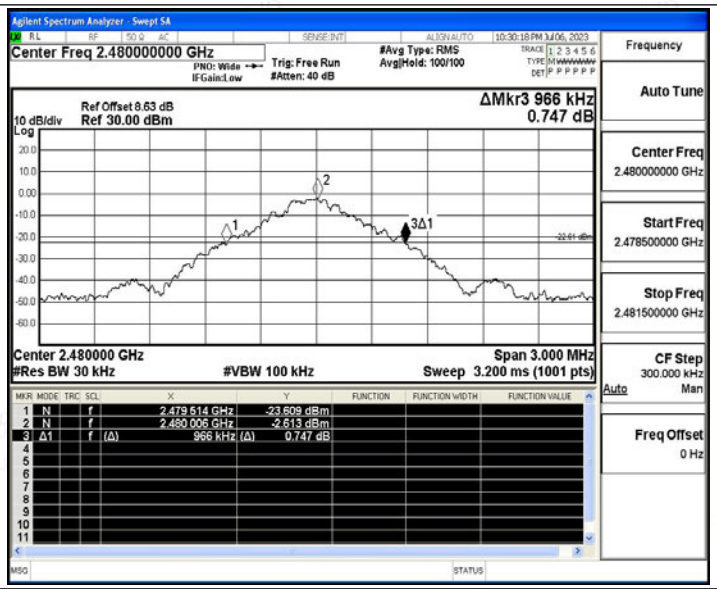
DH5_Ant1_2402



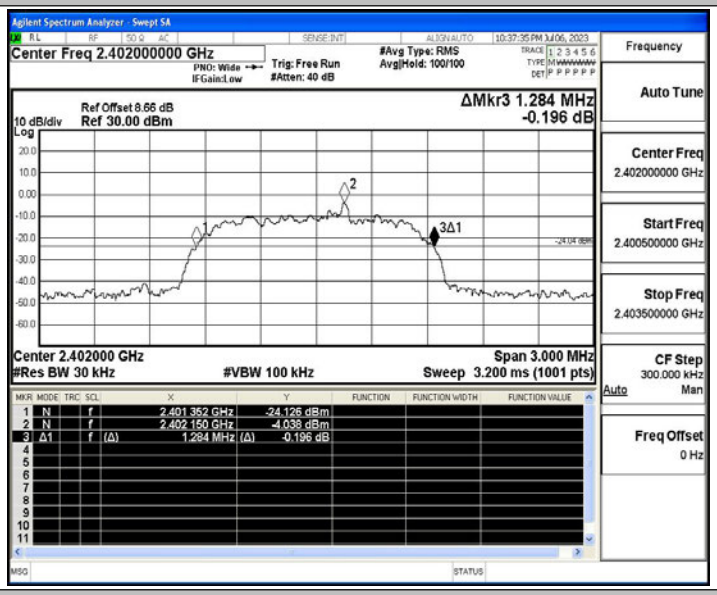

DH5_Ant1_2441



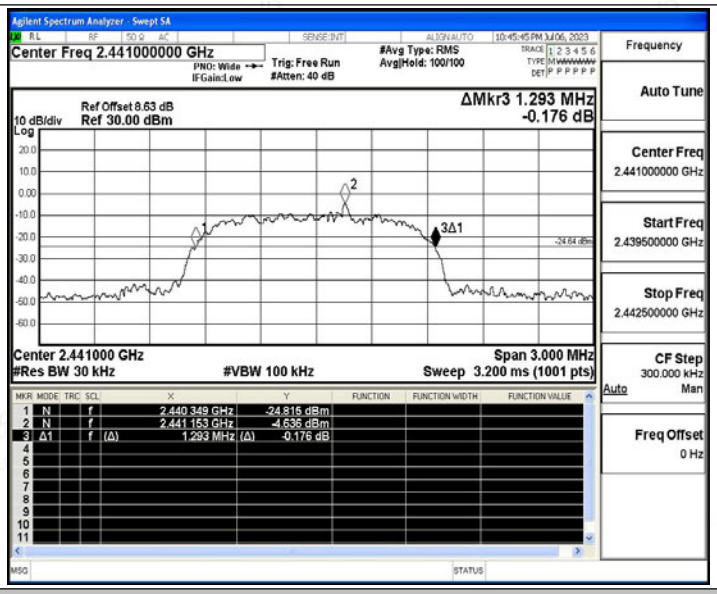

DH5_Ant1_2480



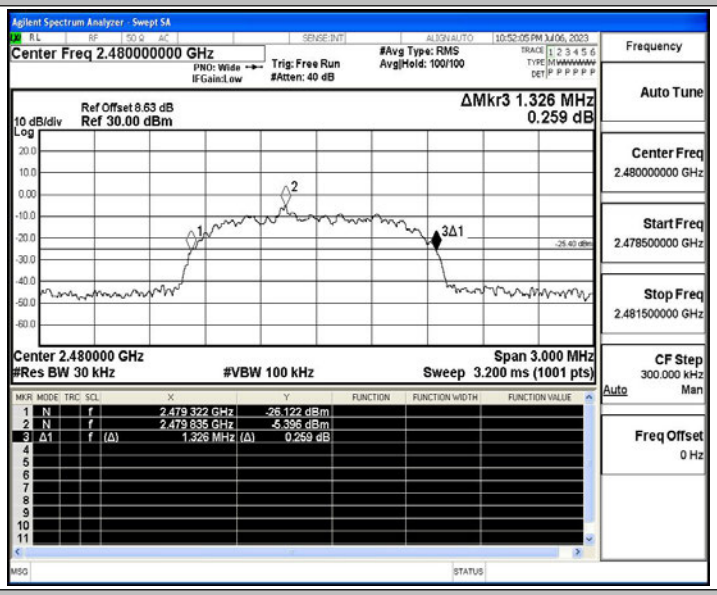

2DH5_Ant1_2402



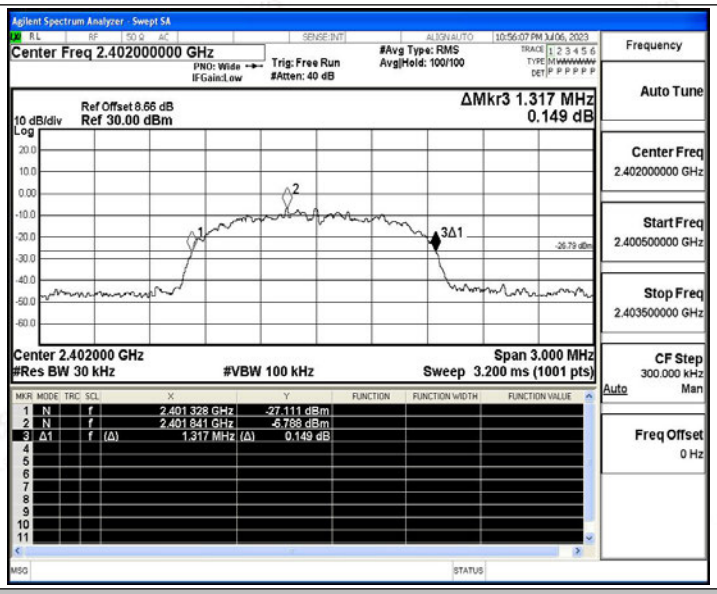

2DH5_Ant1_2441



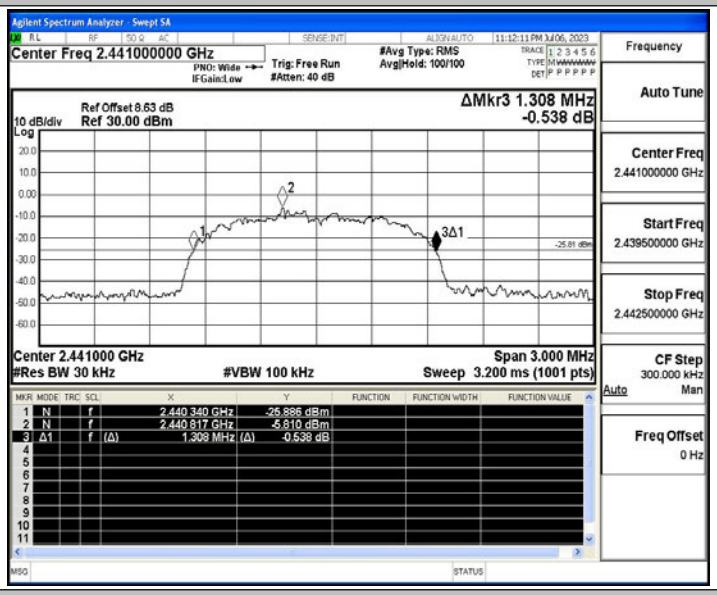

2DH5_Ant1_2480



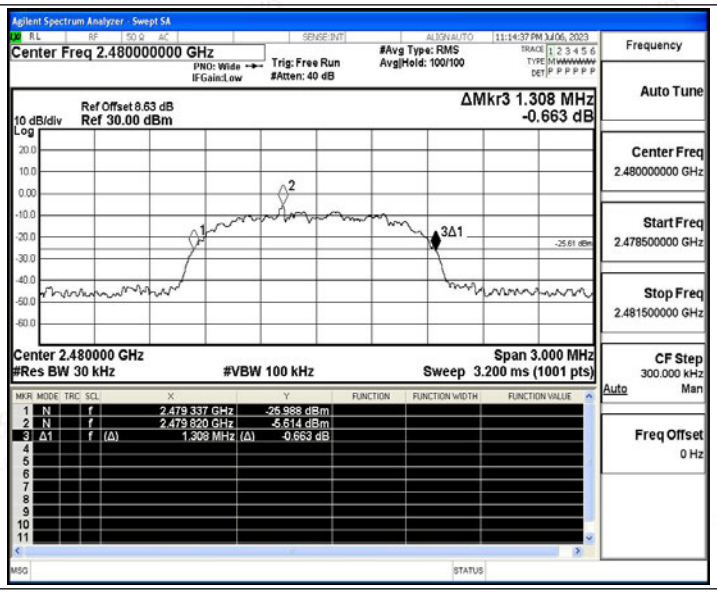

3DH5_Ant1_2402




3DH5_Ant1_2441




3DH5_Ant1_2480


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 100/100
11:14:37 PM Jul 06, 2023
Frequency
Auto Tune
Ref Offset 8.63 dB
10 dB/div
Ref 30.00 dBm
ΔMkr3 1.308 MHz
-0.663 dB
Center Freq
2.480000000 GHz
Start Freq
2.478500000 GHz
Stop Freq
2.481500000 GHz
Center 2.480000 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3.000 MHz
Sweep 3.200 ms (1001 pts)
CF Step
300.000 kHz
Auto
Man
Freq Offset
0 Hz
1 N f 2.479 337 GHz -25.988 dBm
2 N f 2.479 820 GHz -5.514 dBm
3 Δ1 f (Δ) 1.308 MHz (Δ) -0.663 dB

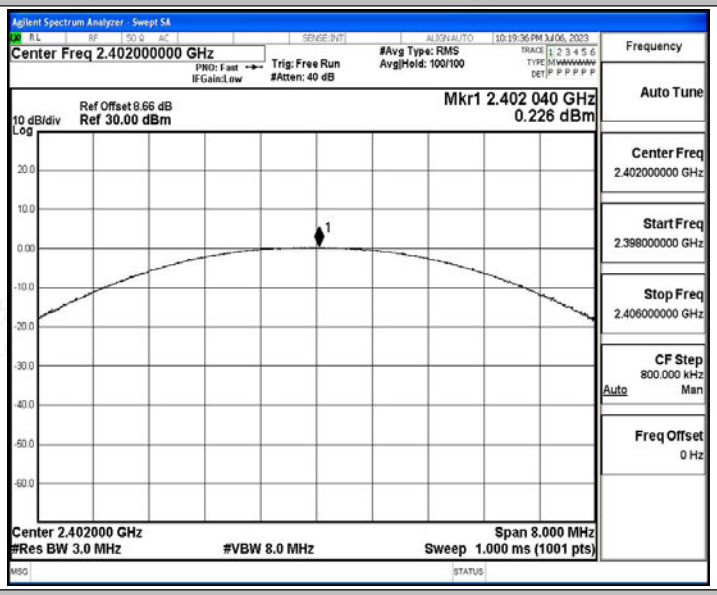
## A.2 Maximum conducted output power

### Test Result Peak

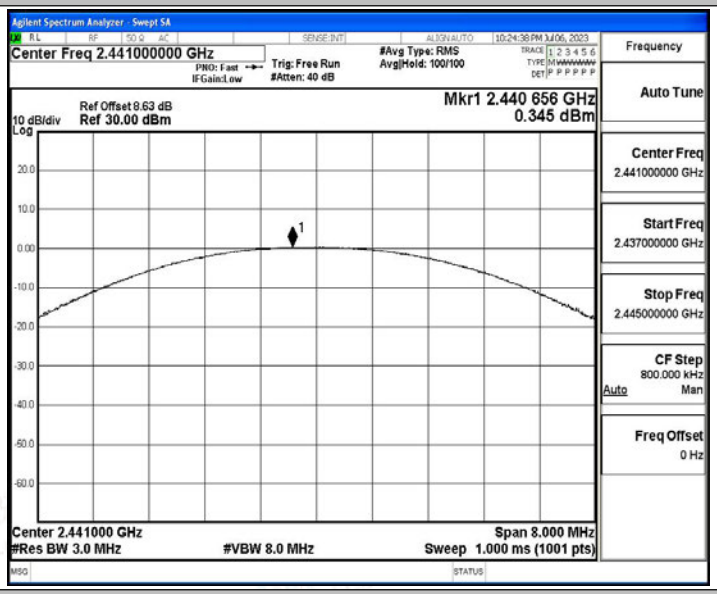
| Test Mode | Antenna | Frequency[MHz] | Conducted Peak Powert[dBm] | Conducted Limit[dBm] | Verdict |
|---|---|---|---|---|---|
| DH5 | Ant1 | 2402 | 0.23 | ≤20.97 | PASS |
| | | 2441 | 0.35 | ≤20.97 | PASS |
| | | 2480 | 0.51 | ≤20.97 | PASS |
| 2DH5 | Ant1 | 2402 | 0.04 | ≤20.97 | PASS |
| | | 2441 | -0.02 | ≤20.97 | PASS |
| | | 2480 | 0.35 | ≤20.97 | PASS |
| 3DH5 | Ant1 | 2402 | 0.08 | ≤20.97 | PASS |
| | | 2441 | 0.24 | ≤20.97 | PASS |
| | | 2480 | 0.32 | ≤20.97 | PASS |

## Test Graphs

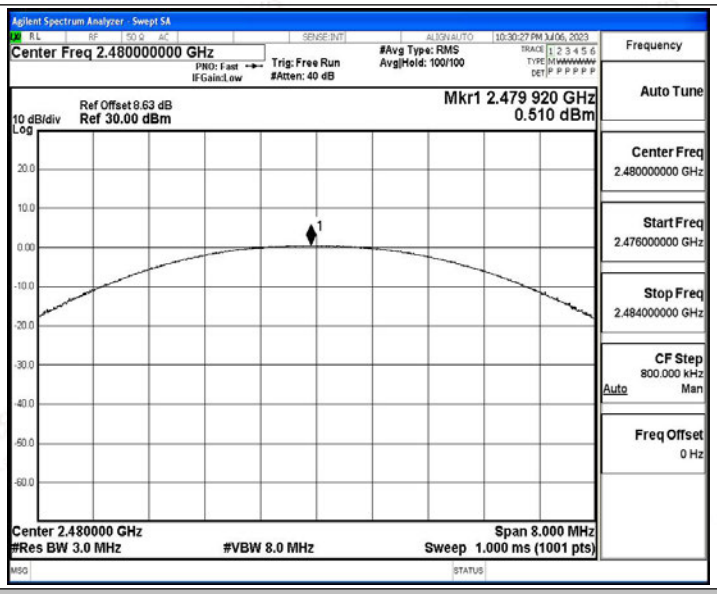
DH5_Ant1_2402



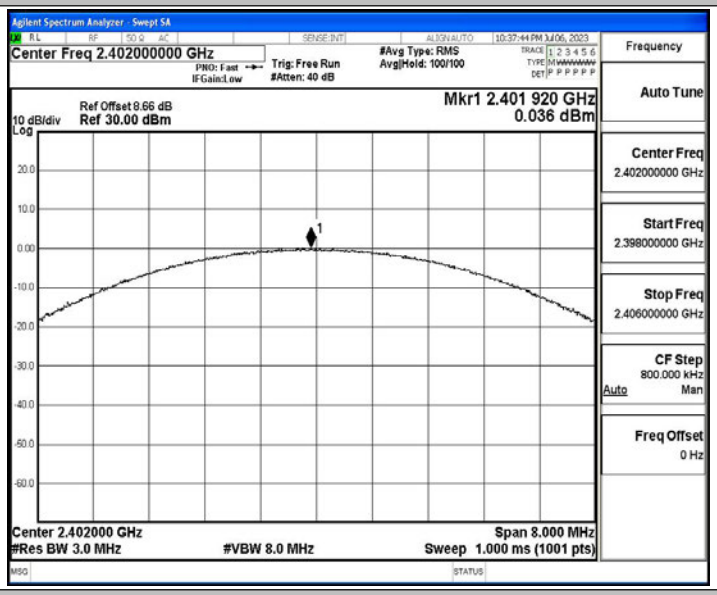

DH5_Ant1_2441



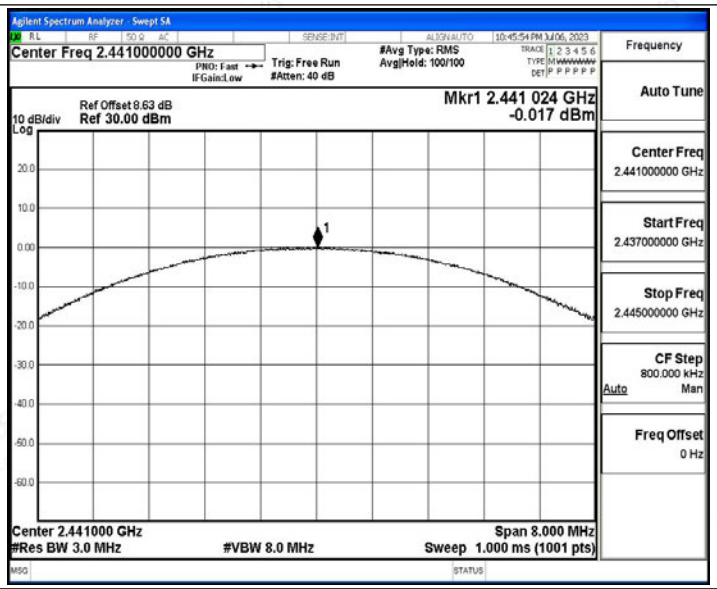

DH5_Ant1_2480



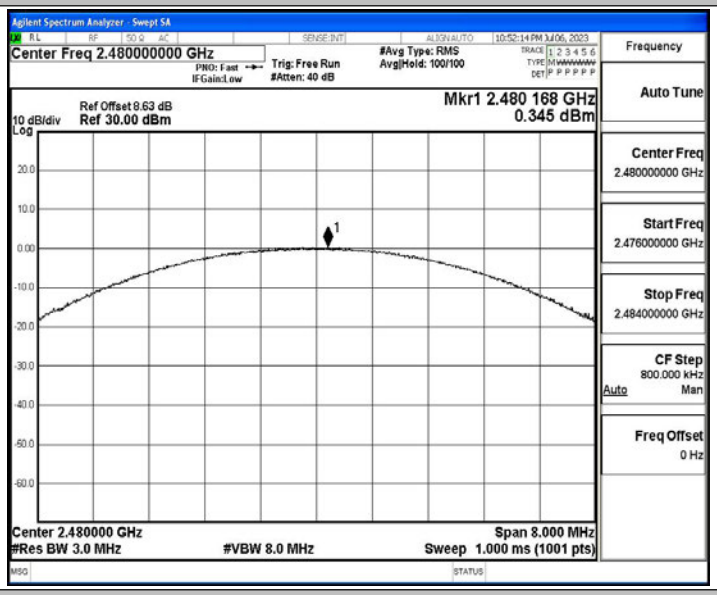

2DH5_Ant1_2402



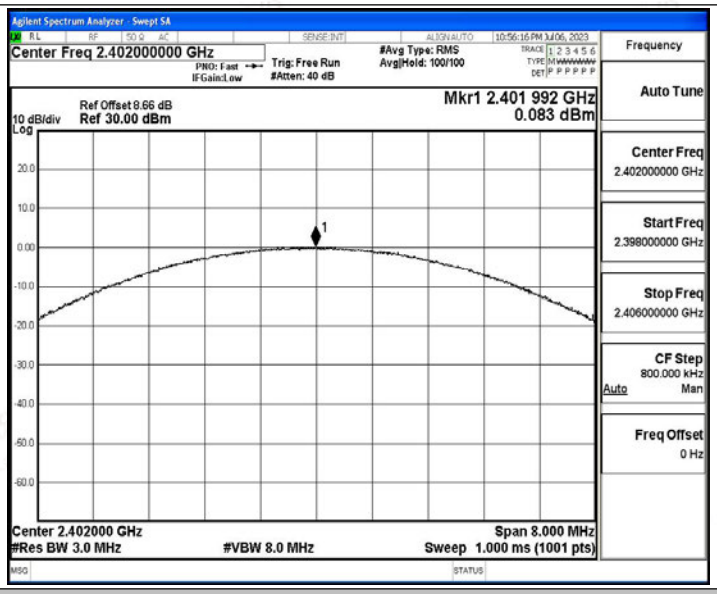

2DH5_Ant1_2441



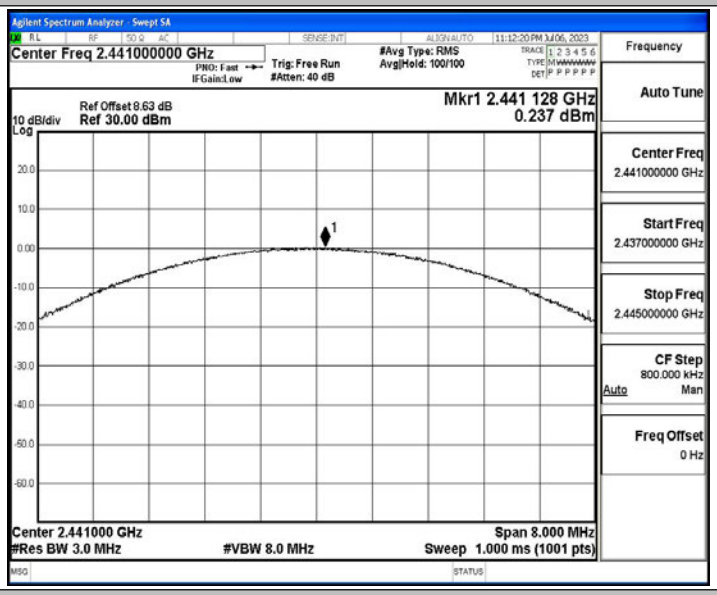

2DH5_Ant1_2480



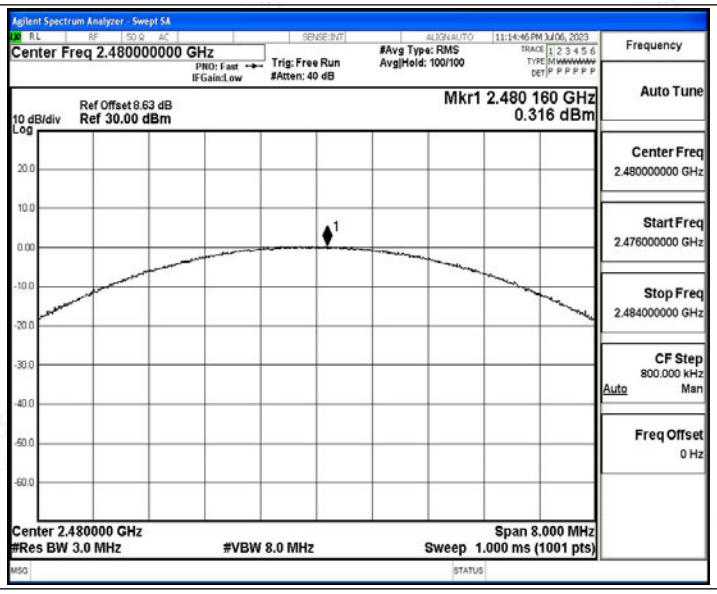

3DH5_Ant1_2402




3DH5_Ant1_2441




3DH5_Ant1_2480


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 100/100
11:14:46 PM Jul 06, 2023
Frequency
Auto Tune
Ref Offset 8.63 dB
10 dB/div
Ref 30.00 dBm
Mkr1 2.480 160 GHz
0.316 dBm
Center Freq
2.480000000 GHz
Start Freq
2.476000000 GHz
Stop Freq
2.484000000 GHz
CF Step
800.000 kHz
Auto
Man
Freq Offset
0 Hz
Center 2.480000 GHz
#Res BW 3.0 MHz
#VBW 8.0 MHz
Span 8.000 MHz
Sweep 1.000 ms (1001 pts)

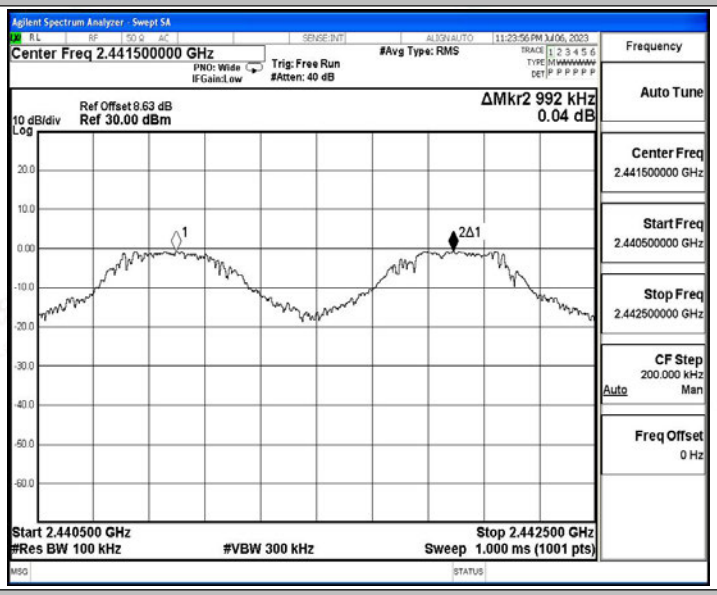
## A.3 Carrier frequency separation

### Test Result

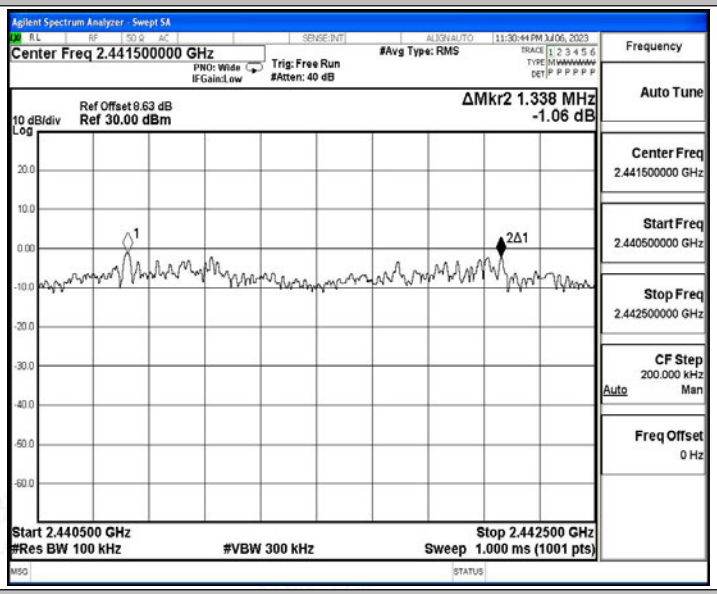
| TestMode | Antenna | Frequency[MHz] | Result[MHz] | Limit[MHz] | Verdict |
|---|---|---|---|---|---|
| DH5 | Ant1 | Hop | 0.992 | ≥0.690 | PASS |
| 2DH5 | Ant1 | Hop | 1.338 | ≥0.884 | PASS |
| 3DH5 | Ant1 | Hop | 1.074 | ≥0.878 | PASS |

## Test Graphs

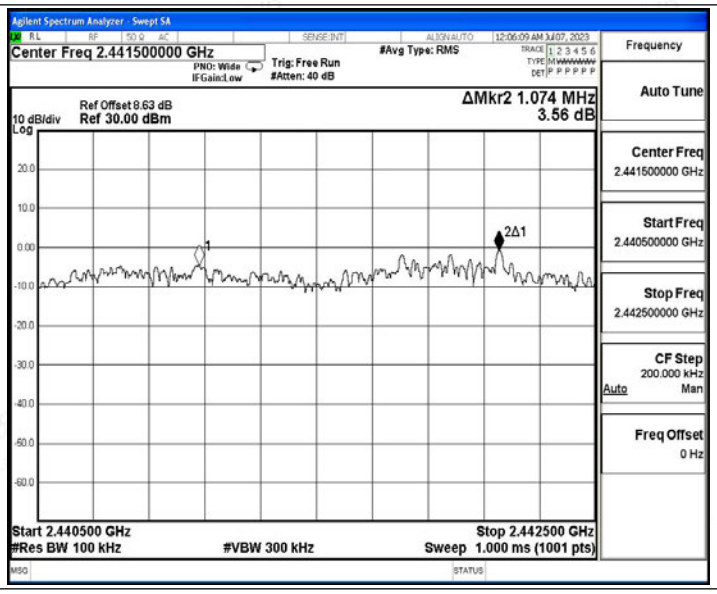
DH5_Ant1_Hop




2DH5_Ant1_Hop




3DH5_Ant1_Hop


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.441500000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
12:06:09 AM Jul 07, 2023
Frequency
Auto Tune
Ref Offset 8.63 dB
10 dB/div Ref 30.00 dBm
Log
ΔMkr2 1.074 MHz
3.56 dB
2Δ1
Center Freq
2.441500000 GHz
Start Freq
2.440500000 GHz
Stop Freq
2.442500000 GHz
CF Step
200.000 kHz
Auto Man
Freq Offset
0 Hz
Start 2.440500 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.442500 GHz
Sweep 1.000 ms (1001 pts)

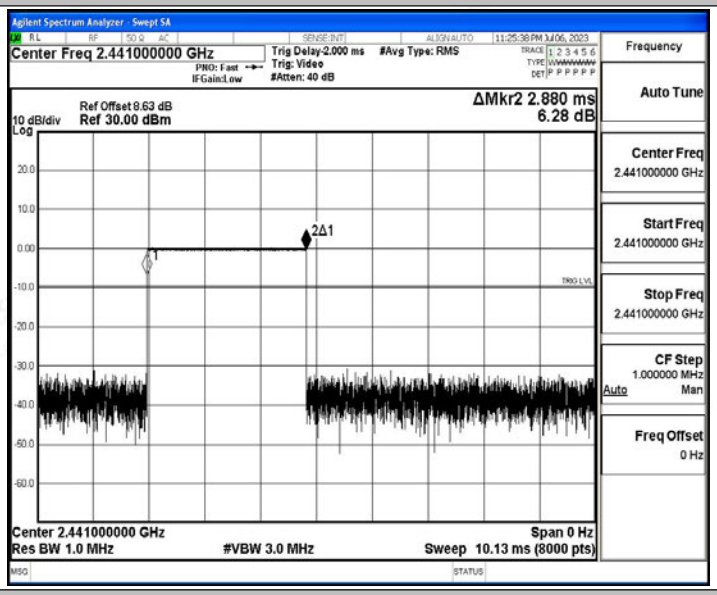
## A.4 Time of occupancy

### Test Result

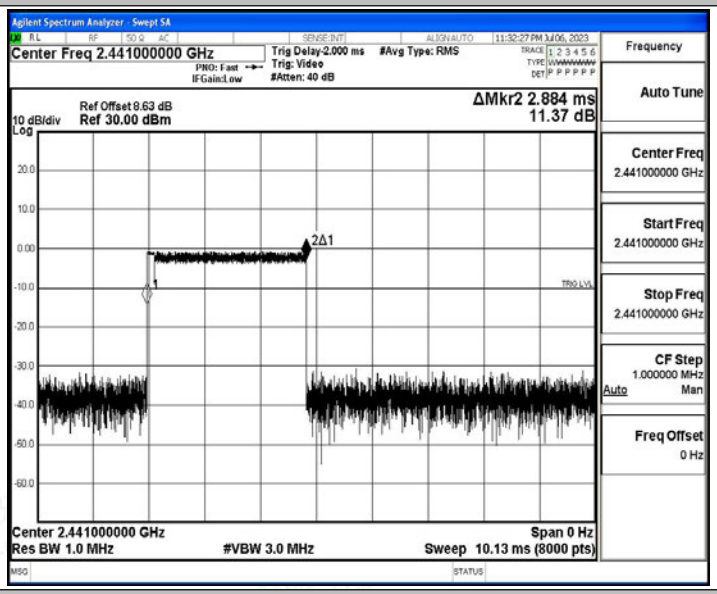
| TestMode | Antenna | Frequency[MHz] | BurstWidth [ms] | TotalHops [Num] | Result[s] | Limit[s] | Verdict |
|---|---|---|---|---|---|---|---|
| DH5 | Ant1 | Hop | 2.880 | 106.67 | 0.307 | ≤0.4 | PASS |
| 2DH5 | Ant1 | Hop | 2.884 | 106.67 | 0.308 | ≤0.4 | PASS |
| 3DH5 | Ant1 | Hop | 2.887 | 106.67 | 0.308 | ≤0.4 | PASS |

## Test Graphs

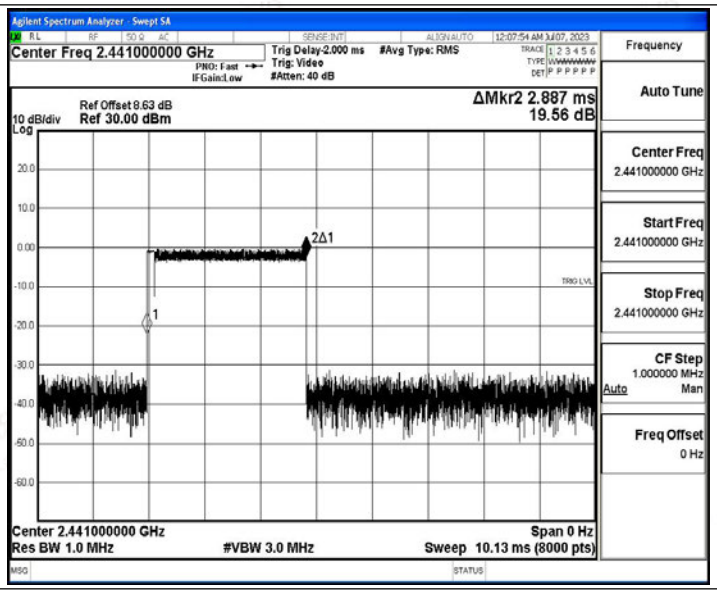
DH5_Ant1_Hop




2DH5_Ant1_Hop




3DH5_Ant1_Hop


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.441000000 GHz
Trig Delay-2.000 ms
Trig: Video
#Atten: 40 dB
#Avg Type: RMS
Ref Offset 8.63 dB
10 dB/div Ref 30.00 dBm
ΔMkr2 2.887 ms
19.56 dB
2Δ1
1
Center 2.441000000 GHz
Res BW 1.0 MHz
#VBW 3.0 MHz
Span 0 Hz
Sweep 10.13 ms (8000 pts)
Frequency
Auto Tune
Center Freq
2.441000000 GHz
Start Freq
2.441000000 GHz
Stop Freq
2.441000000 GHz
CF Step
1.000000 MHz
Auto Man
Freq Offset
0 Hz

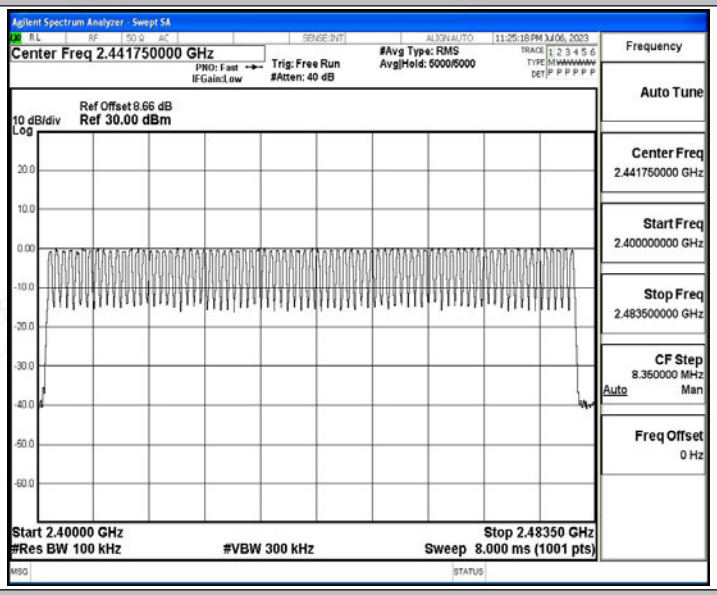
# A.5 Number of hopping channels

## Test Result

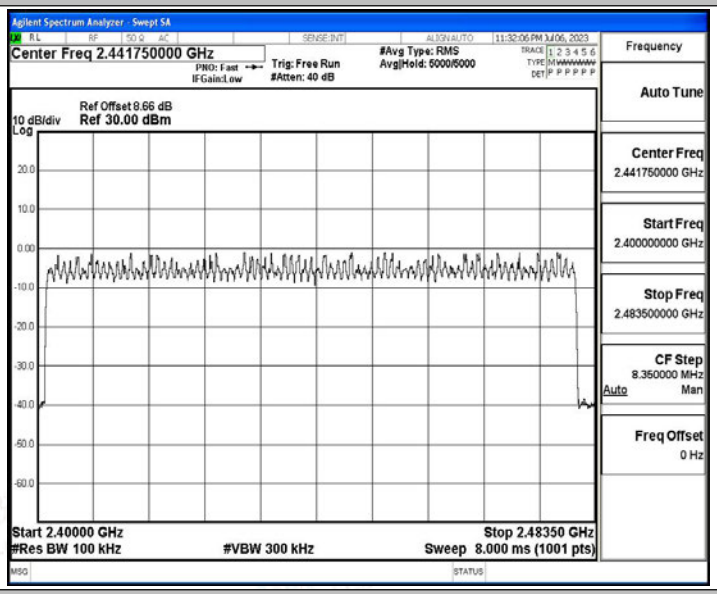
| TestMode | Antenna | Frequency[MHz] | Result[Num] | Limit[Num] | Verdict |
|---|---|---|---|---|---|
| DH5 | Ant1 | Hop | 79 | ≥15 | PASS |
| 2DH5 | Ant1 | Hop | 79 | ≥15 | PASS |
| 3DH5 | Ant1 | Hop | 79 | ≥15 | PASS |

## Test Graphs

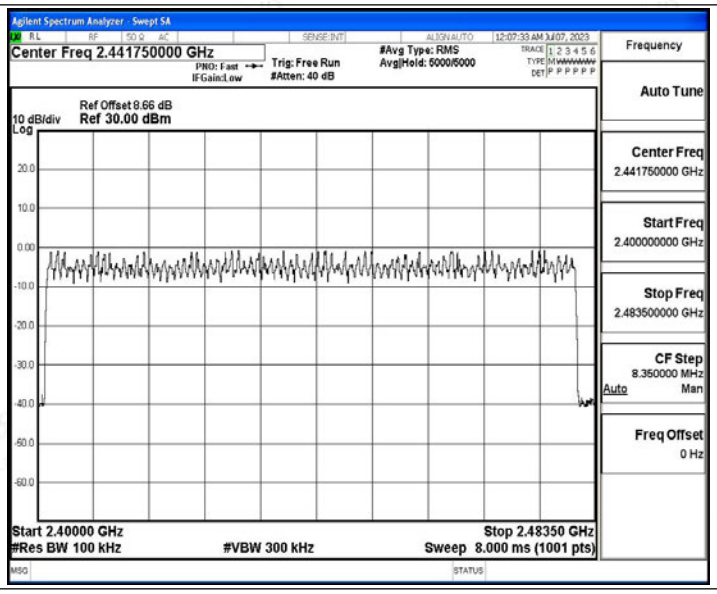
DH5_Ant1_Hop




2DH5_Ant1_Hop




3DH5_Ant1_Hop


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.441750000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 5000/5000
12:07:33 AM Jul 07, 2023
Ref Offset 8.66 dB
10 dB/div Ref 30.00 dBm
Log
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
Start 2.40000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.48350 GHz
Sweep 8.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.441750000 GHz
Start Freq
2.400000000 GHz
Stop Freq
2.483500000 GHz
CF Step
8.350000 MHz
Auto
Man
Freq Offset
0 Hz

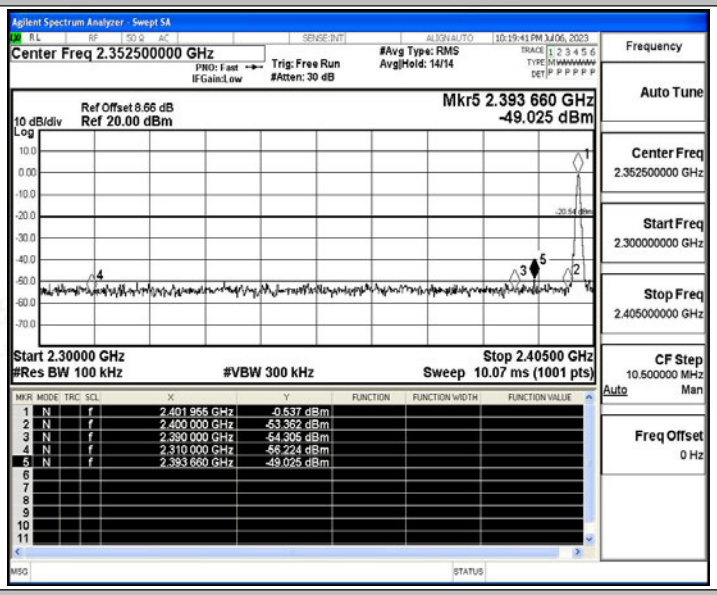
# A.6 Band edge measurements

## Test Result

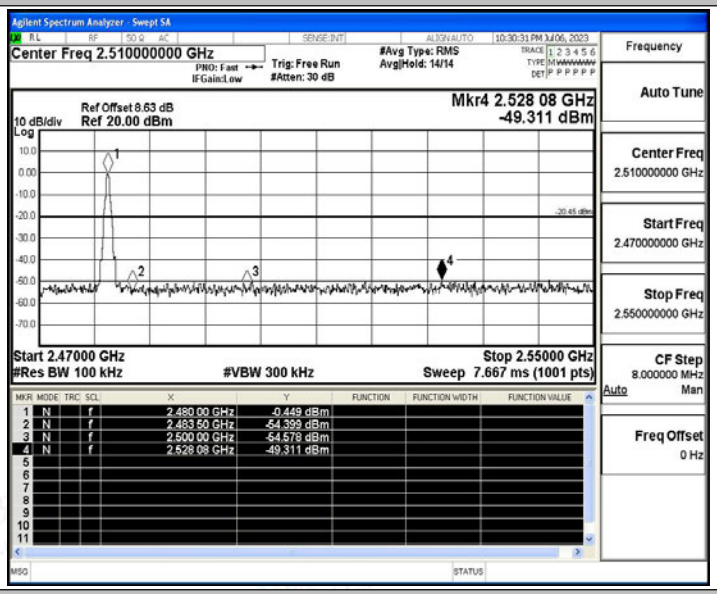
| TestMode | Antenna | ChName | Frequency[MHz] | RefLevel [dBm] | Result [dBm] | Limit [dBm] | Verdict |
|---|---|---|---|---|---|---|---|
| DH5 | Ant1 | Low | 2402 | -0.54 | -49.03 | ≤-20.54 | PASS |
| | | High | 2480 | -0.45 | -49.31 | ≤-20.45 | PASS |
| | | Low | Hop_2402 | -1.05 | -49.11 | ≤-21.05 | PASS |
| | | High | Hop_2480 | -0.03 | -47.96 | ≤-20.03 | PASS |
| 2DH5 | Ant1 | Low | 2402 | -5.09 | -50.45 | ≤-25.09 | PASS |
| | | High | 2480 | -4.56 | -48.76 | ≤-24.56 | PASS |
| | | Low | Hop_2402 | -2.24 | -49.48 | ≤-22.24 | PASS |
| | | High | Hop_2480 | -3.22 | -47.87 | ≤-23.22 | PASS |
| 3DH5 | Ant1 | Low | 2402 | -3.91 | -49.29 | ≤-23.91 | PASS |
| | | High | 2480 | -4.81 | -48 | ≤-24.81 | PASS |
| | | Low | Hop_2402 | -3.88 | -48.71 | ≤-23.88 | PASS |
| | | High | Hop_2480 | -1.24 | -48.08 | ≤-21.24 | PASS |

## Test Graphs

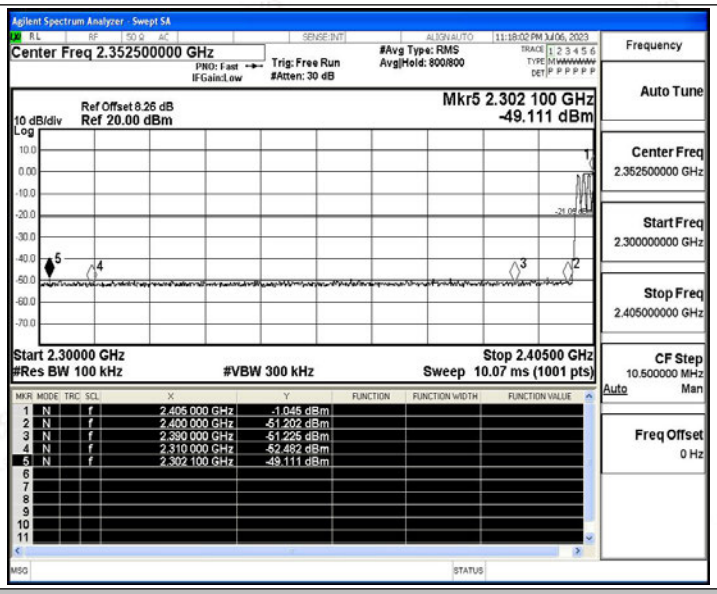
DH5_Ant1_Low_2402



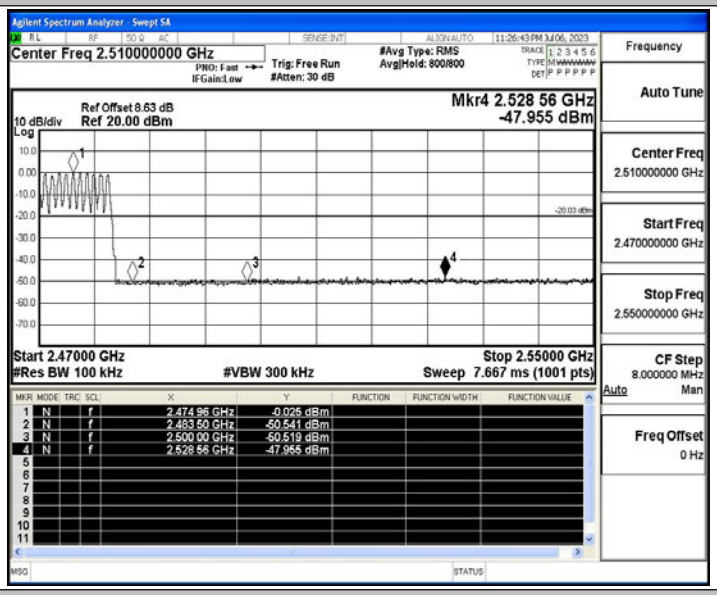

DH5_Ant1_High_2480



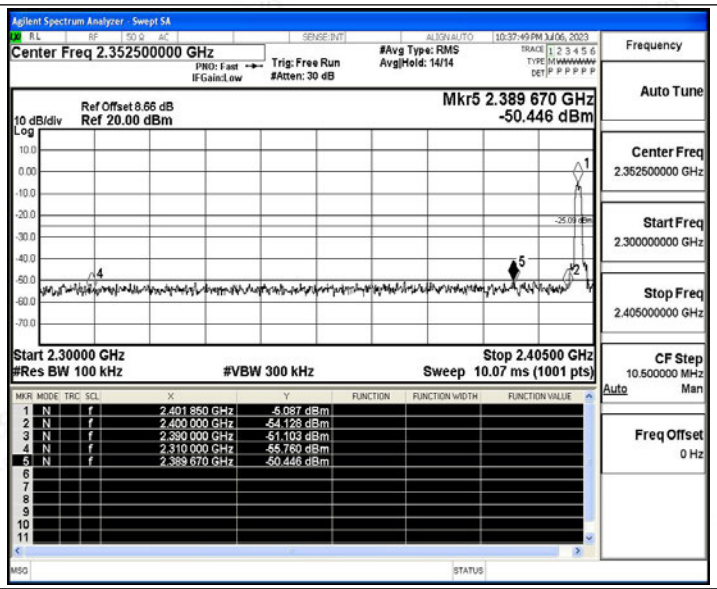

DH5_Ant1_Low_Hop_2402



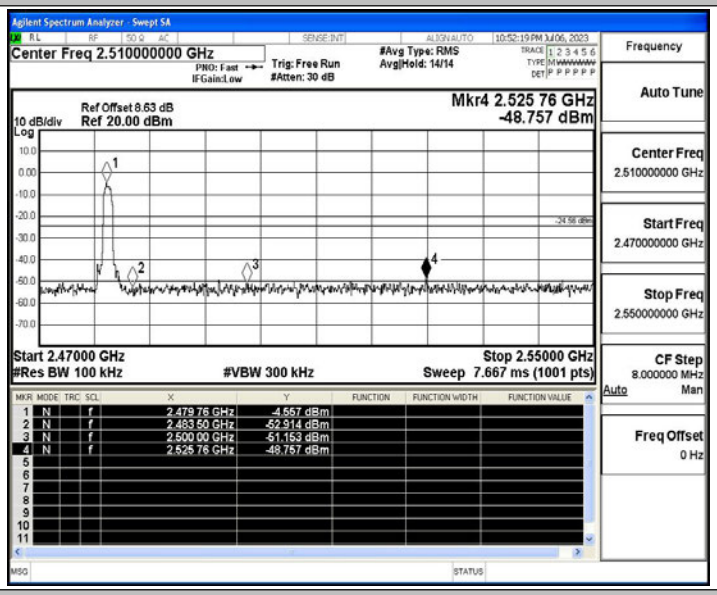

DH5_Ant1_High_Hop_2480



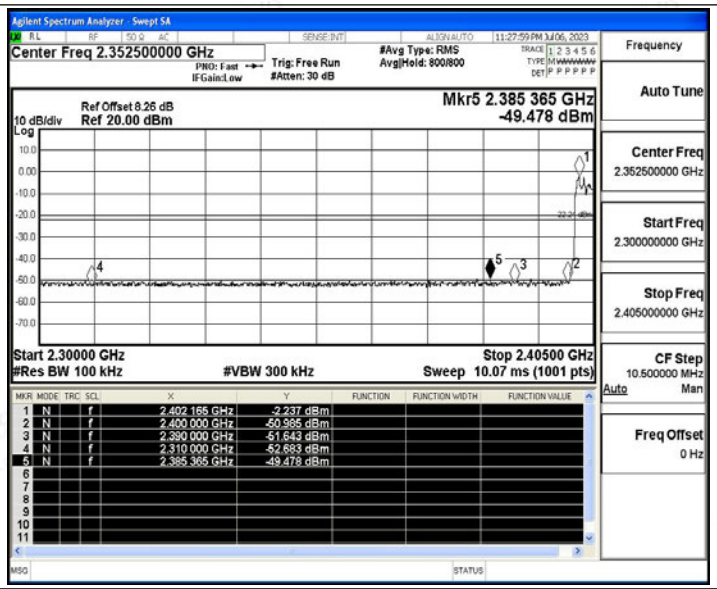

2DH5_Ant1_Low_2402



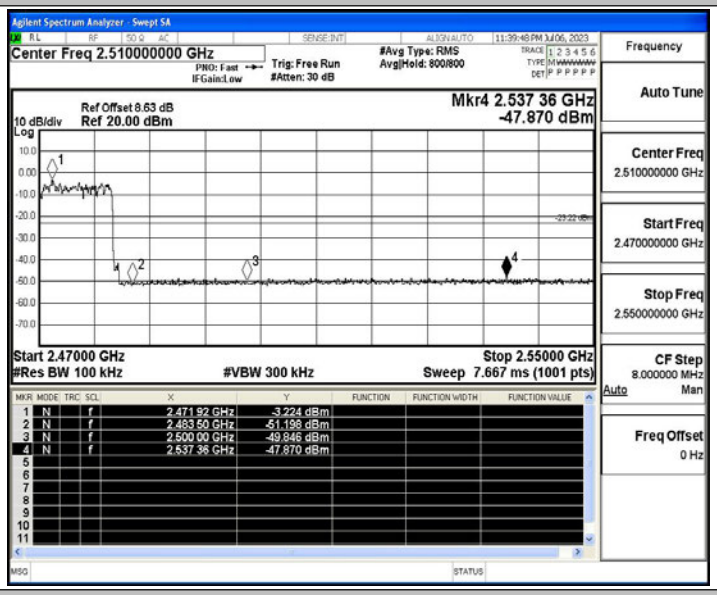

2DH5_Ant1_High_2480



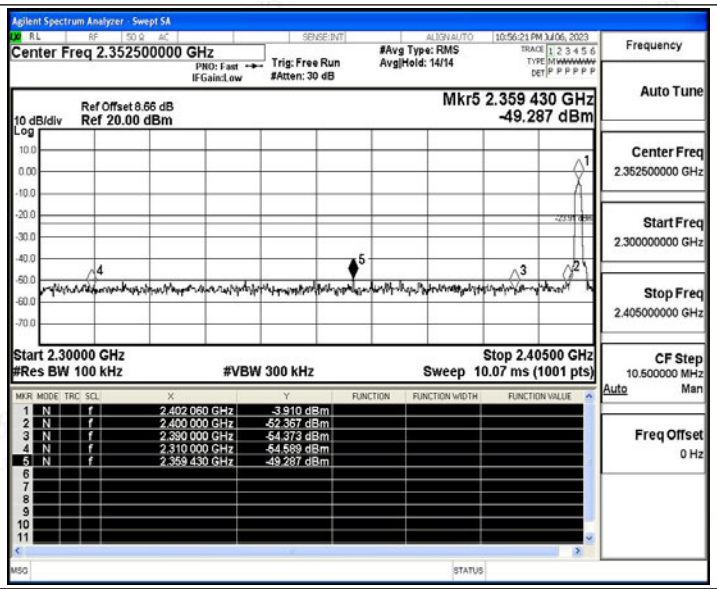

2DH5_Ant1_Low_Hop_2402



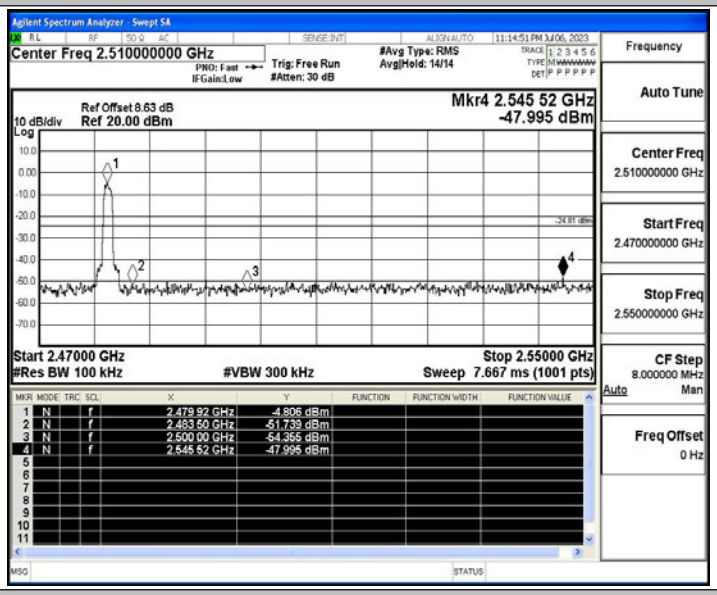

2DH5_Ant1_High_Hop_2480



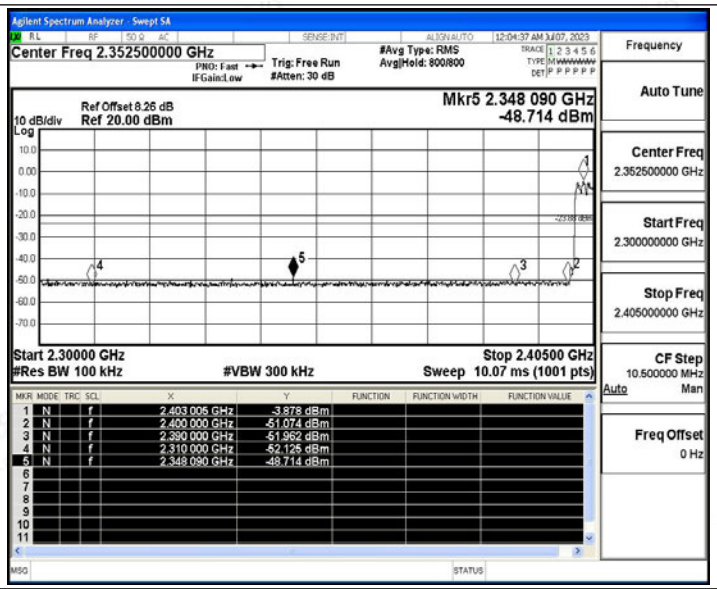

3DH5_Ant1_Low_2402



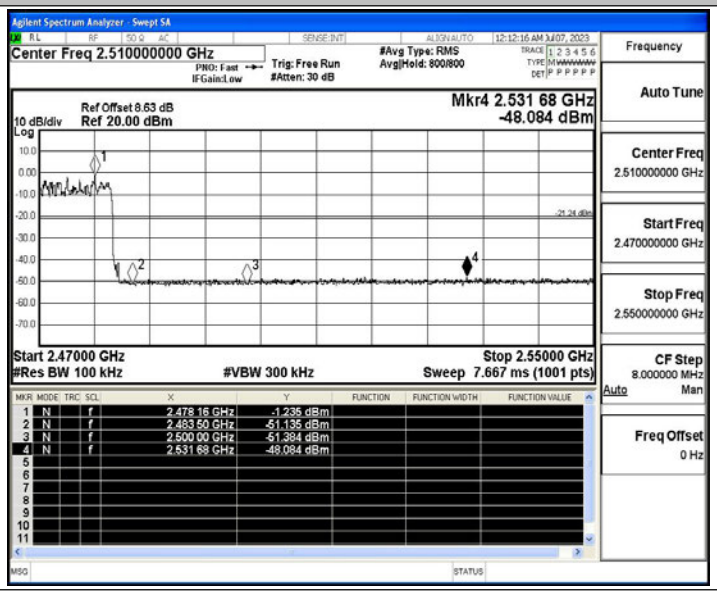

3DH5_Ant1_High_2480




3DH5_Ant1_Low_Hop_2402




3DH5_Ant1_High_Hop_2480



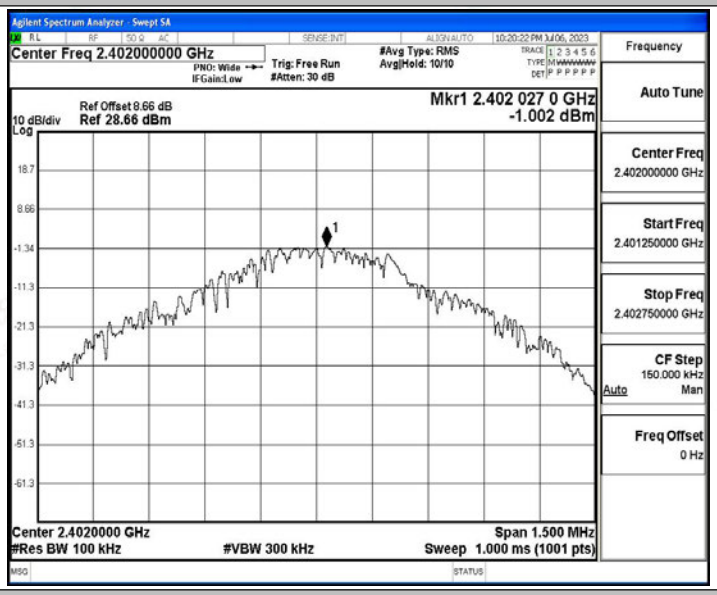
# A.7 Conducted Spurious Emission

## Test Result

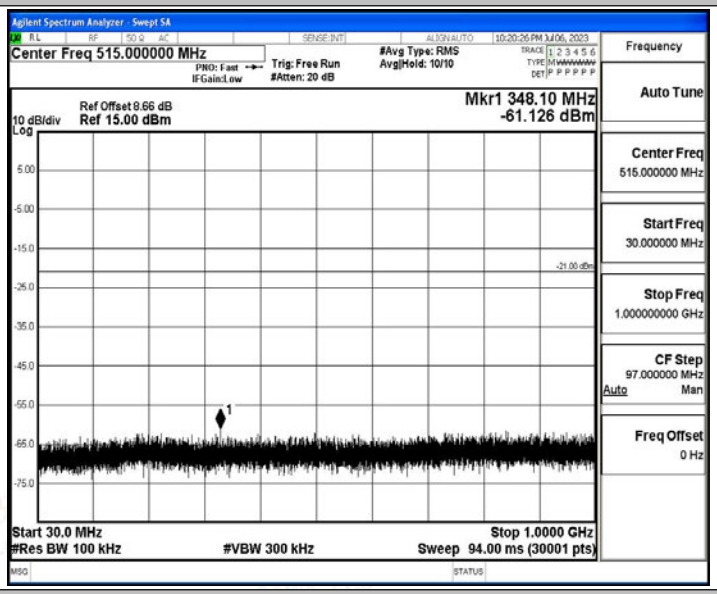
| TestMode | Antenna | Frequency[MHz] | FreqRange [MHz] | RefLevel [dBm] | Result [dBm] | Limit [dBm] | Verdict |
|---|---|---|---|---|---|---|---|
| DH5 | Ant1 | 2402 | Reference | -1.00 | -1.00 | --- | PASS |
| | | | 30~1000 | -1.00 | -61.13 | ≤-21 | PASS |
| | | | 1000~26500 | -1.00 | -46.83 | ≤-21 | PASS |
| | | 2441 | Reference | -0.99 | -0.99 | --- | PASS |
| | | | 30~1000 | -0.99 | -60.62 | ≤-20.99 | PASS |
| | | | 1000~26500 | -0.99 | -45.85 | ≤-20.99 | PASS |
| | | 2480 | Reference | -0.67 | -0.67 | --- | PASS |
| | | | 30~1000 | -0.67 | -61.55 | ≤-20.67 | PASS |
| | | | 1000~26500 | -0.67 | -47.32 | ≤-20.67 | PASS |
| 2DH5 | Ant1 | 2402 | Reference | -5.57 | -5.57 | --- | PASS |
| | | | 30~1000 | -5.57 | -60.82 | ≤-25.57 | PASS |
| | | | 1000~26500 | -5.57 | -46.47 | ≤-25.57 | PASS |
| | | 2441 | Reference | -5.34 | -5.34 | --- | PASS |
| | | | 30~1000 | -5.34 | -53.94 | ≤-25.34 | PASS |
| | | | 1000~26500 | -5.34 | -46.87 | ≤-25.34 | PASS |
| | | 2480 | Reference | -5.70 | -5.70 | --- | PASS |
| | | | 30~1000 | -5.70 | -61.33 | ≤-25.7 | PASS |
| | | | 1000~26500 | -5.70 | -45.44 | ≤-25.7 | PASS |
| 3DH5 | Ant1 | 2402 | Reference | -4.68 | -4.68 | --- | PASS |
| | | | 30~1000 | -4.68 | -61.26 | ≤-24.68 | PASS |
| | | | 1000~26500 | -4.68 | -46.19 | ≤-24.68 | PASS |
| | | 2441 | Reference | -5.34 | -5.34 | --- | PASS |
| | | | 30~1000 | -5.34 | -60.63 | ≤-25.34 | PASS |
| | | | 1000~26500 | -5.34 | -46.25 | ≤-25.34 | PASS |
| | | 2480 | Reference | -4.84 | -4.84 | --- | PASS |
| | | | 30~1000 | -4.84 | -61.16 | ≤-24.84 | PASS |
| | | | 1000~26500 | -4.84 | -46.36 | ≤-24.84 | PASS |

## Test Graphs

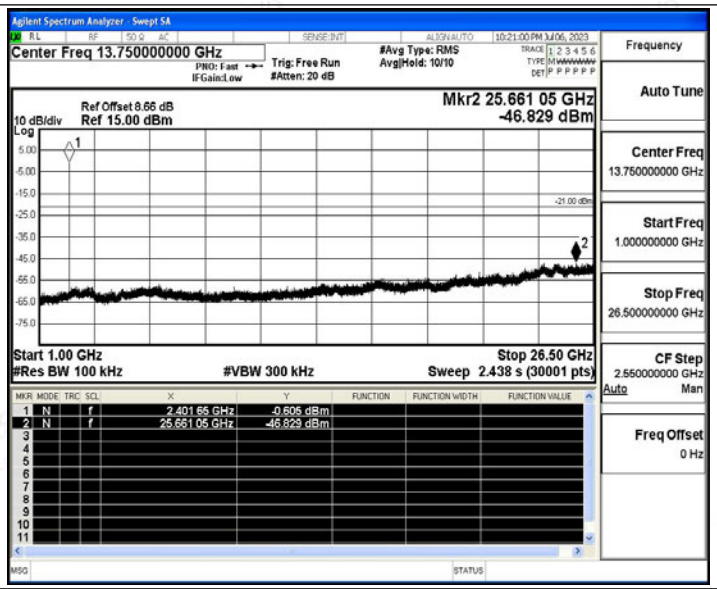
DH5_Ant1_2402_0~Reference



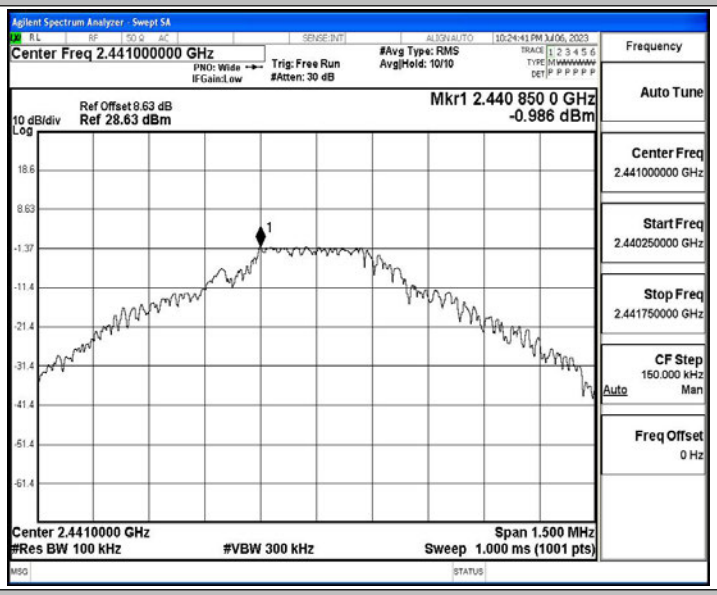

DH5_Ant1_2402_30~1000



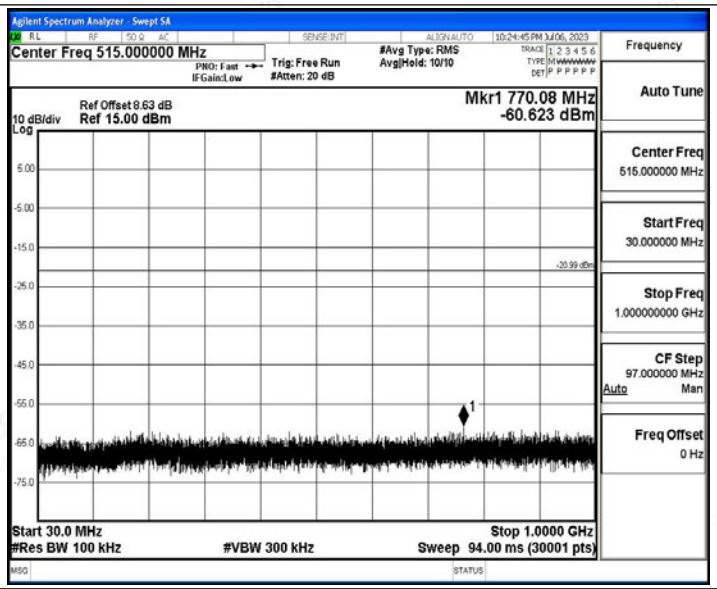

DH5_Ant1_2402_1000~26500



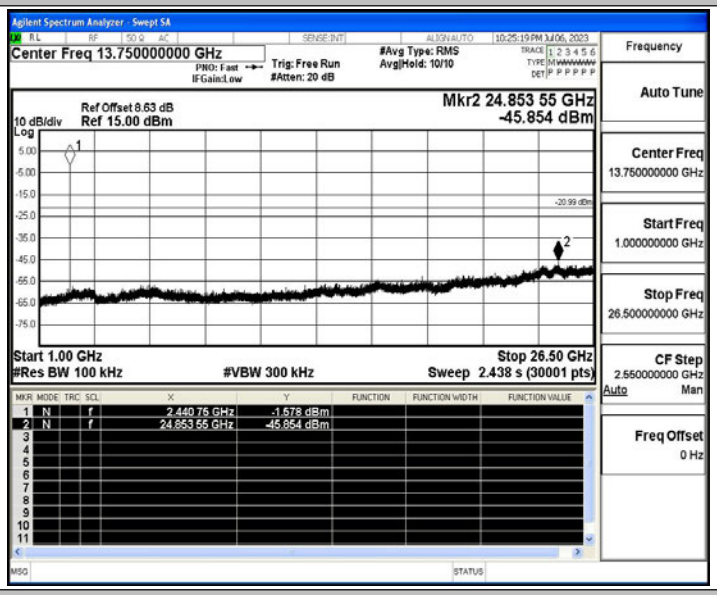

DH5_Ant1_2441_0~Reference



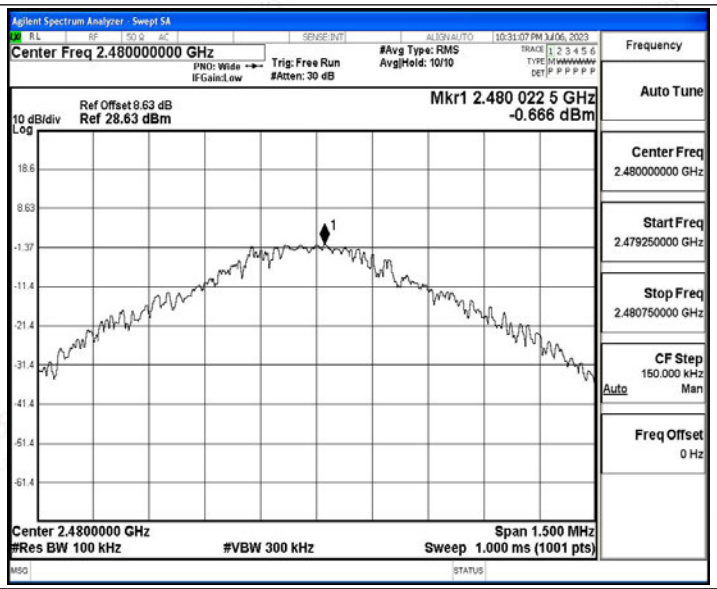

DH5_Ant1_2441_30~1000



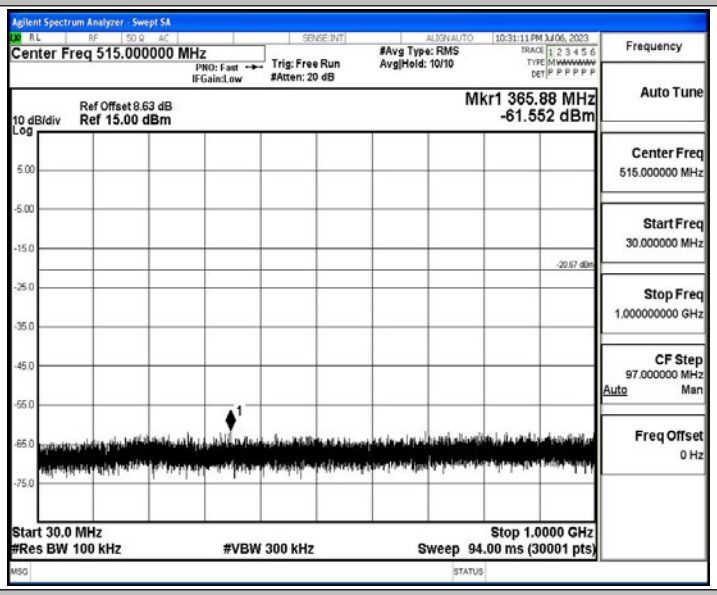

DH5_Ant1_2441_1000~26500



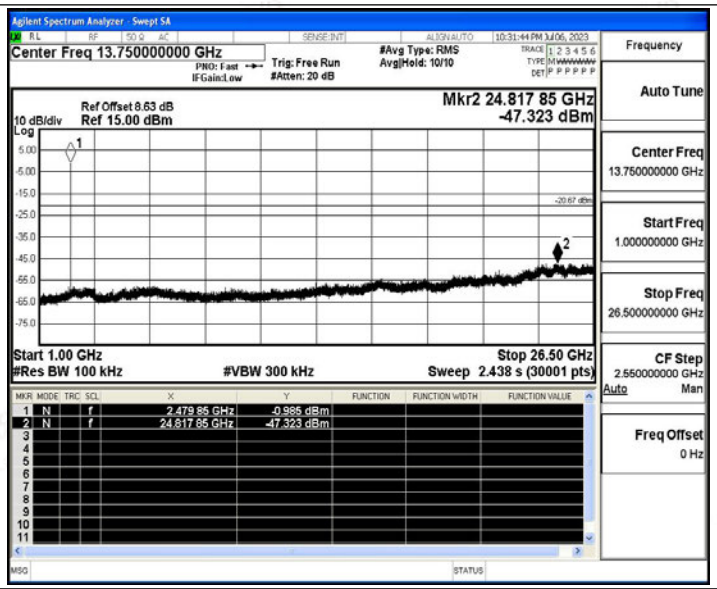

DH5_Ant1_2480_0~Reference



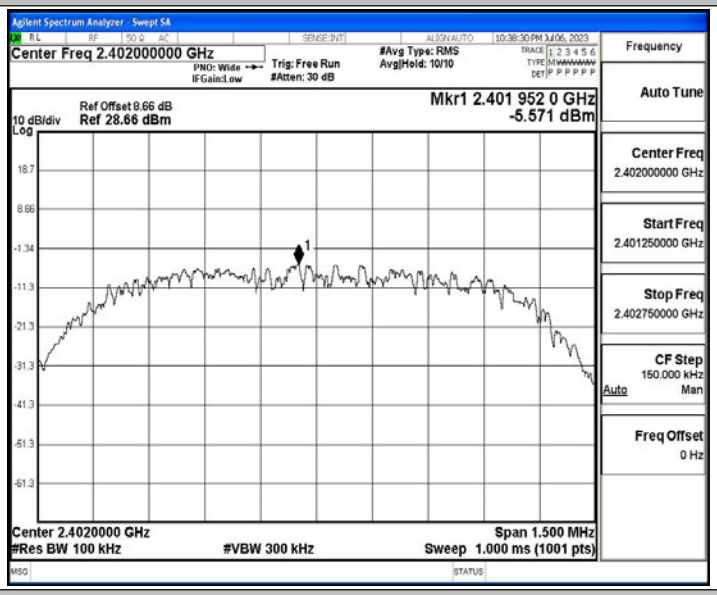

DH5_Ant1_2480_30~1000



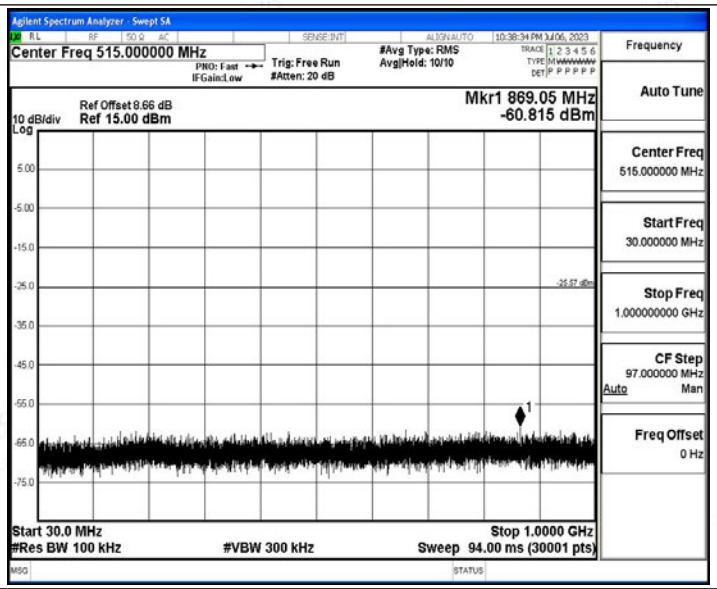

DH5_Ant1_2480_1000~26500



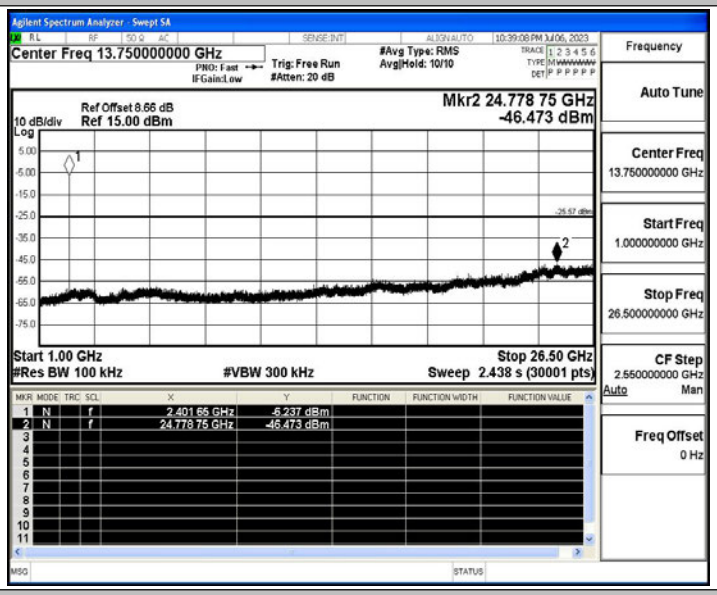

2DH5_Ant1_2402_0~Reference



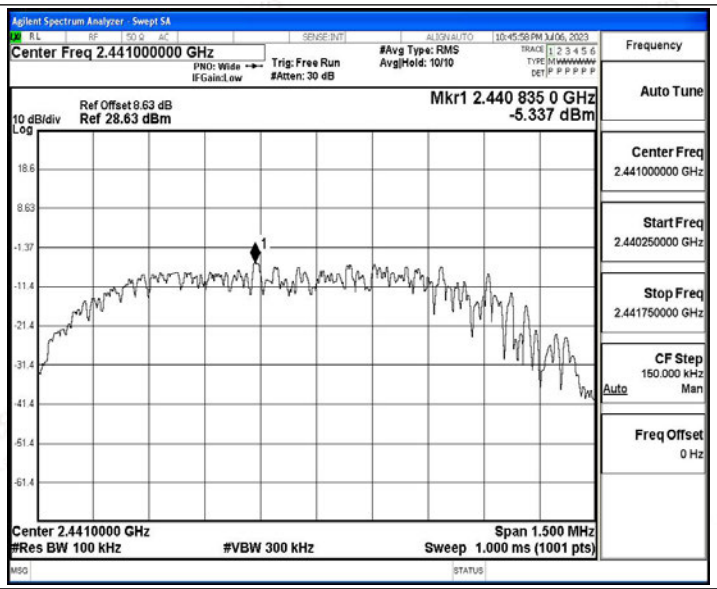

2DH5_Ant1_2402_30~1000



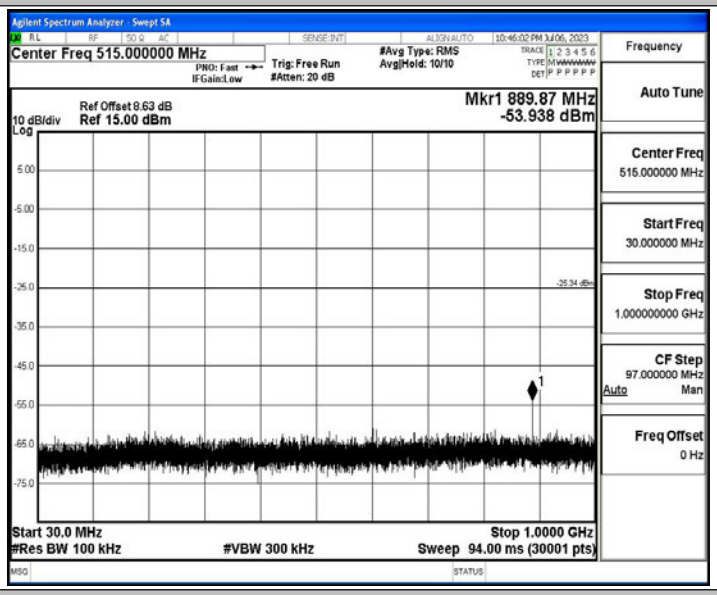

2DH5_Ant1_2402_1000~26500



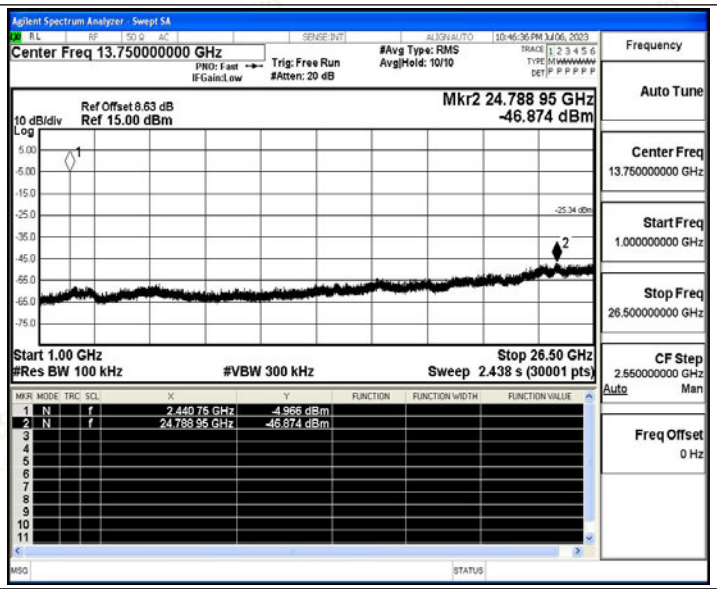

2DH5_Ant1_2441_0~Reference



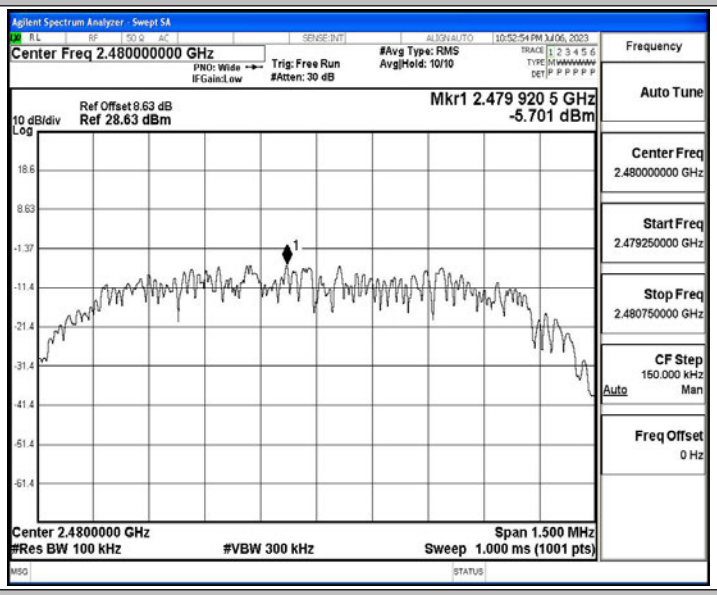

2DH5_Ant1_2441_30~1000



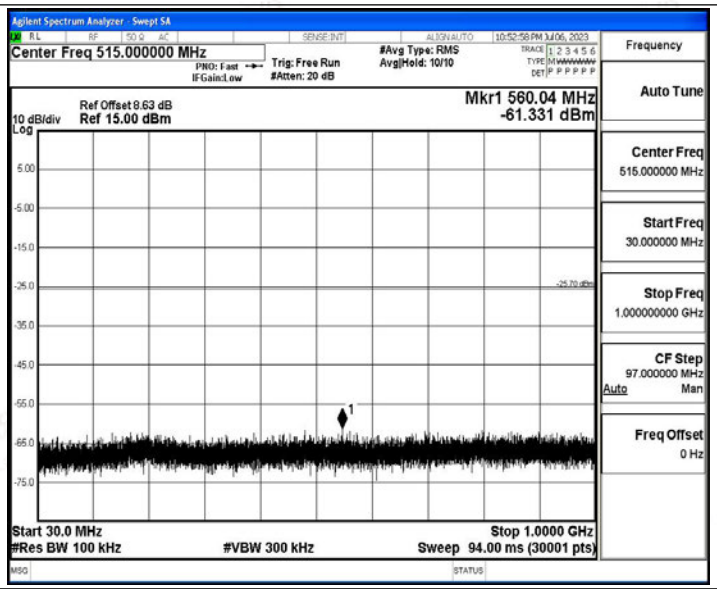

2DH5_Ant1_2441_1000~26500



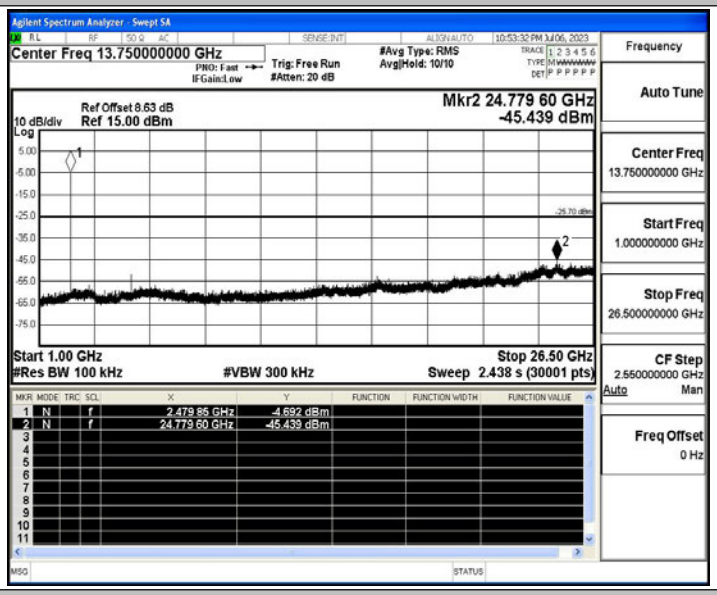

2DH5_Ant1_2480_0~Reference



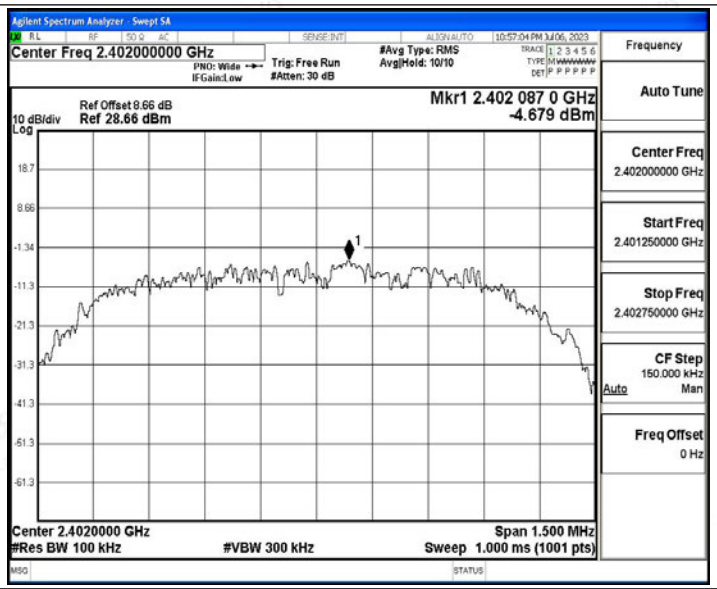

2DH5_Ant1_2480_30~1000



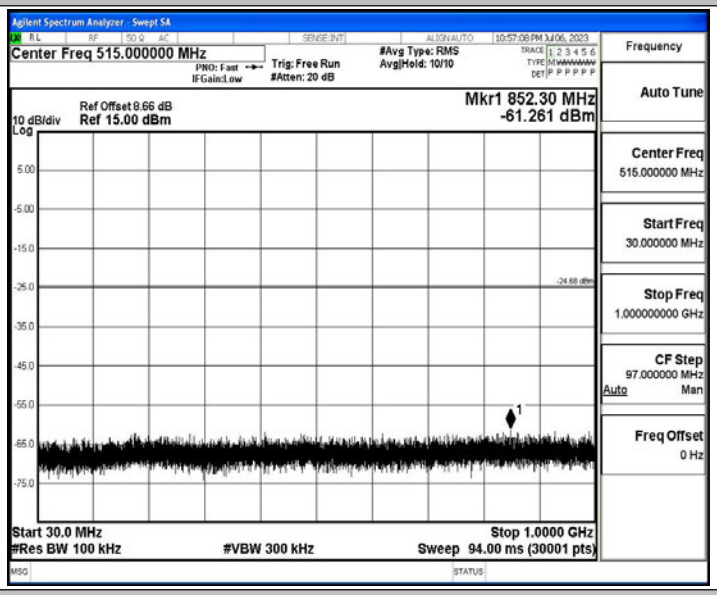

2DH5_Ant1_2480_1000~26500



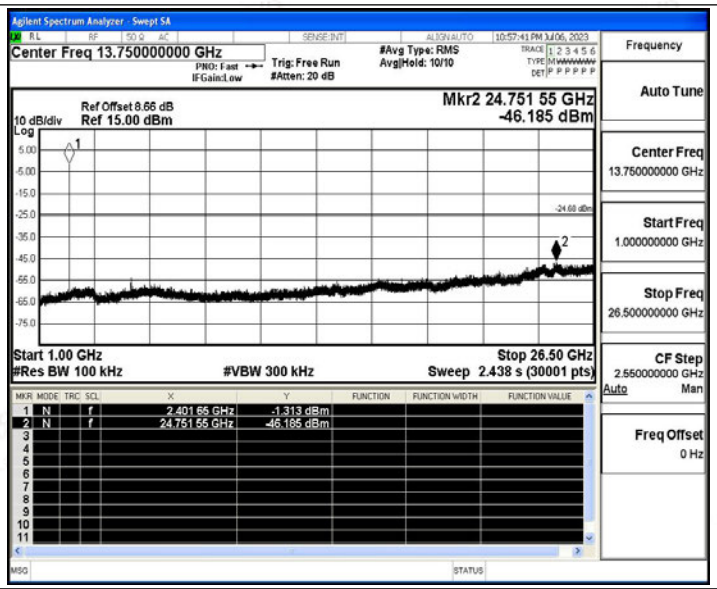

3DH5_Ant1_2402_0~Reference



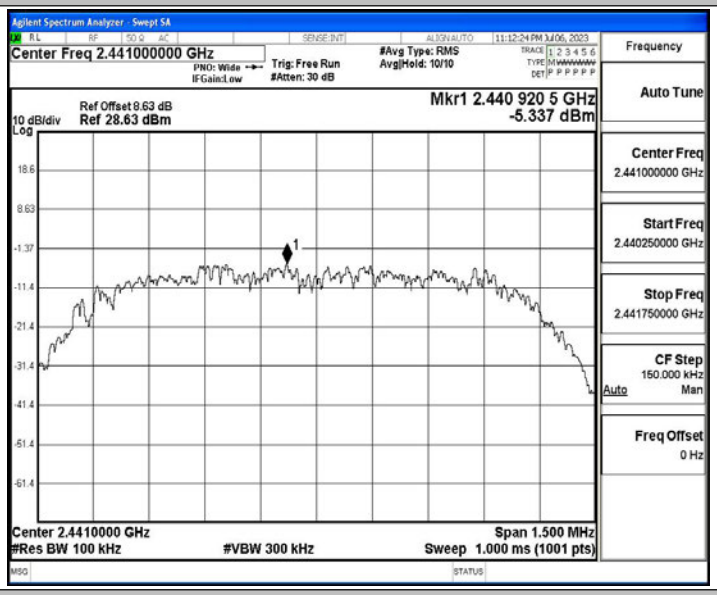

3DH5_Ant1_2402_30~1000



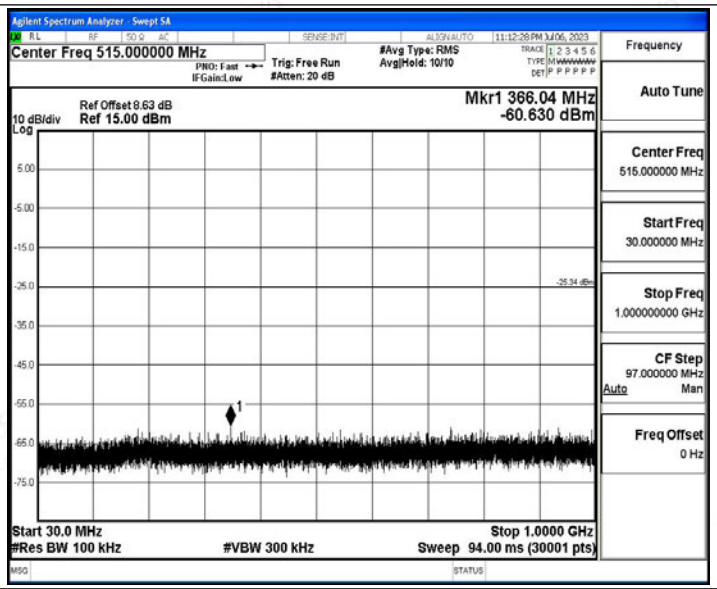

3DH5_Ant1_2402_1000~26500



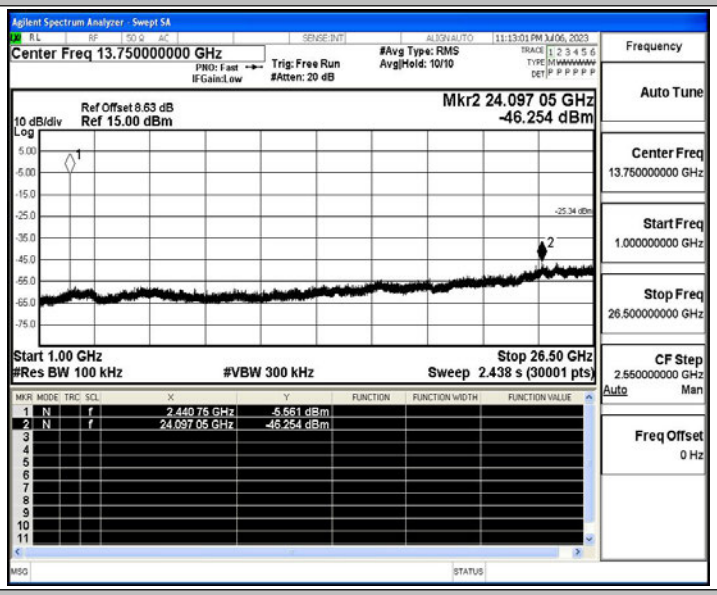

3DH5_Ant1_2441_0~Reference



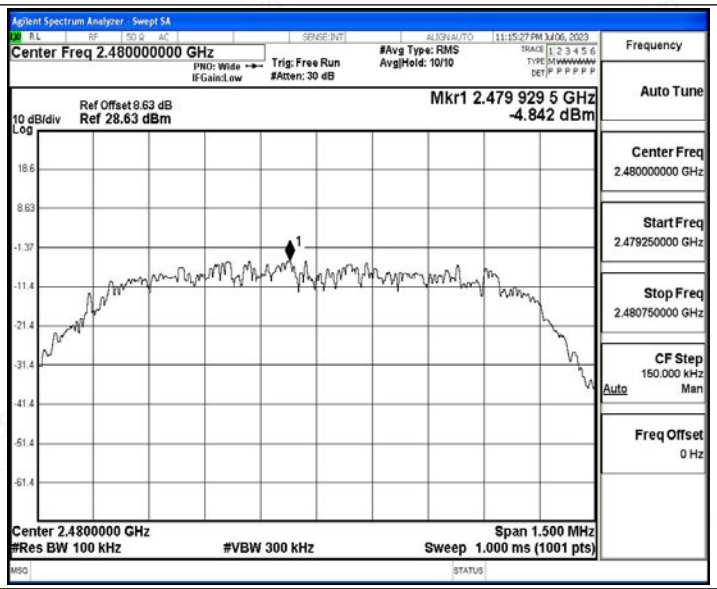

3DH5_Ant1_2441_30~1000



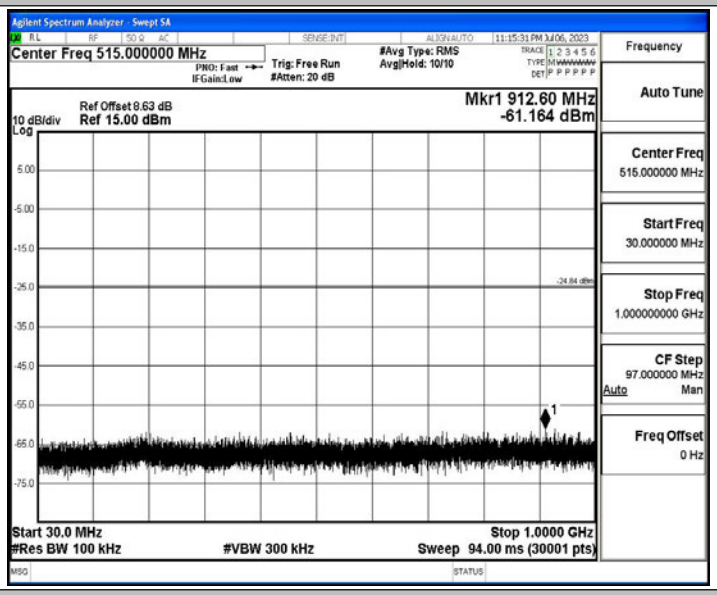

3DH5_Ant1_2441_1000~26500



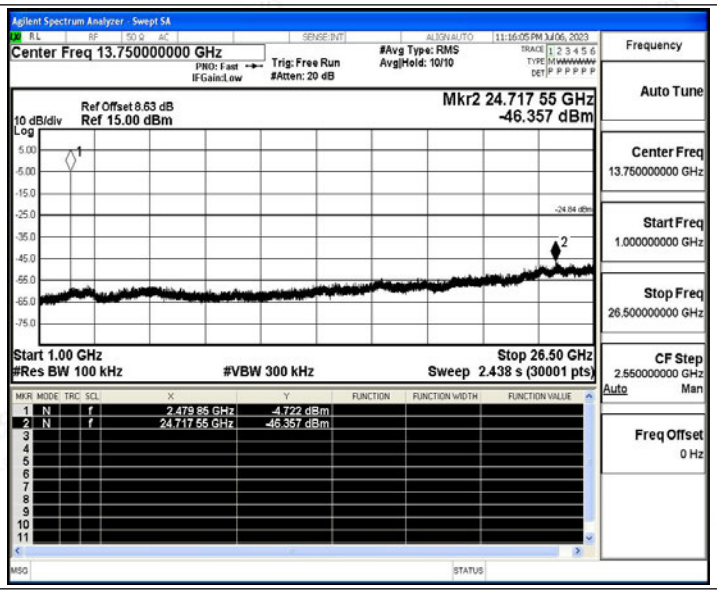

3DH5_Ant1_2480_0~Reference




3DH5_Ant1_2480_30~1000




3DH5_Ant1_2480_1000~26500


Agilent Spectrum Analyzer - Swept SA
Center Freq 13.750000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 10/10
11:16:05 PM Jul 06, 2023
Frequency
Auto Tune
Ref Offset 8.63 dB
10 dB/div
Ref 15.00 dBm
Mkr2 24.717 55 GHz
-46.357 dBm
Center Freq
13.750000000 GHz
Start Freq
1.000000000 GHz
Stop Freq
26.500000000 GHz
Start 1.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep 2.438 s (30001 pts)
CF Step
2.550000000 GHz
Auto
Man
Freq Offset
0 Hz
1 N f 2.479 85 GHz -4.722 dBm
2 N f 24.717 55 GHz -46.357 dBm

## A.8 Emissions in Restricted Bands

### Test Result

| TestMode | Antenna | ChName | Frequency[MHz] | Detector | Freq [MHz] | Result [dBm] | Limit [dBm] | Result [dBuV/m] | Limit [dBuV/m] | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| DH5 | Ant1 | Low | 2402 | AV | 2310.000 | -48.3 | ≤-41.20 | 46.90 | ≤54 | PASS |
| | | | | AV | 2377.910 | -47.82 | ≤-41.20 | 47.38 | ≤54 | PASS |
| | | | | AV | 2390.000 | -47.94 | ≤-41.20 | 47.26 | ≤54 | PASS |
| | | | | Peak | 2310.000 | -44.45 | ≤-21.20 | 50.75 | ≤74 | PASS |
| | | | | Peak | 2359.745 | -38.3 | ≤-21.20 | 56.90 | ≤74 | PASS |
| | | | | Peak | 2390.000 | -41.49 | ≤-21.20 | 53.71 | ≤74 | PASS |
| | | High | 2480 | AV | 2483.500 | -47.39 | ≤-41.20 | 47.81 | ≤54 | PASS |
| | | | | AV | 2499.280 | -47.23 | ≤-41.20 | 47.97 | ≤54 | PASS |
| | | | | AV | 2500.000 | -47.37 | ≤-41.20 | 47.83 | ≤54 | PASS |
| | | | | Peak | 2483.500 | -39.82 | ≤-21.20 | 55.38 | ≤74 | PASS |
| | | | | Peak | 2492.320 | -38.05 | ≤-21.20 | 57.15 | ≤74 | PASS |
| | | | | Peak | 2500.000 | -40.7 | ≤-21.20 | 54.50 | ≤74 | PASS |
| | | Low | Hop_2402 | Peak | 2310.000 | -40.83 | ≤-21.20 | 54.37 | ≤74 | PASS |
| | | | | Peak | 2358.590 | -36.87 | ≤-21.20 | 58.33 | ≤74 | PASS |
| | | | | Peak | 2390.000 | -39.33 | ≤-21.20 | 55.87 | ≤74 | PASS |
| | | High | Hop_2480 | Peak | 2483.500 | -38.83 | ≤-21.20 | 56.37 | ≤74 | PASS |
| | | | | Peak | 2498.640 | -37.2 | ≤-21.20 | 58.00 | ≤74 | PASS |
| | | | | Peak | 2500.000 | -38.23 | ≤-21.20 | 56.97 | ≤74 | PASS |
| 2DH5 | Ant1 | Low | 2402 | AV | 2310.000 | -48.31 | ≤-41.20 | 46.89 | ≤54 | PASS |
| | | | | AV | 2386.520 | -47.65 | ≤-41.20 | 47.55 | ≤54 | PASS |
| | | | | AV | 2390.000 | -47.93 | ≤-41.20 | 47.27 | ≤54 | PASS |
| | | | | Peak | 2310.000 | -42.61 | ≤-21.20 | 52.59 | ≤74 | PASS |
| | | | | Peak | 2311.235 | -38.76 | ≤-21.20 | 56.44 | ≤74 | PASS |
| | | | | Peak | 2390.000 | -43.75 | ≤-21.20 | 51.45 | ≤74 | PASS |
| | | High | 2480 | AV | 2483.500 | -47.25 | ≤-41.20 | 47.95 | ≤54 | PASS |
| | | | | AV | 2495.360 | -47.23 | ≤-41.20 | 47.97 | ≤54 | PASS |
| | | | | AV | 2500.000 | -47.42 | ≤-41.20 | 47.78 | ≤54 | PASS |
| | | | | Peak | 2483.500 | -43.36 | ≤-21.20 | 51.84 | ≤74 | PASS |
| | | | | Peak | 2498.960 | -38.31 | ≤-21.20 | 56.89 | ≤74 | PASS |
| | | | | Peak | 2500.000 | -42.49 | ≤-21.20 | 52.71 | ≤74 | PASS |
| | | Low | Hop_2402 | Peak | 2310.000 | -40.31 | ≤-21.20 | 54.89 | ≤74 | PASS |
| | | | | Peak | 2348.615 | -37.85 | ≤-21.20 | 57.35 | ≤74 | PASS |
| | | | | Peak | 2390.000 | -40.69 | ≤-21.20 | 54.51 | ≤74 | PASS |
| | | High | Hop_2480 | Peak | 2483.500 | -39.66 | ≤-21.20 | 55.54 | ≤74 | PASS |
| | | | | Peak | 2487.600 | -37.53 | ≤-21.20 | 57.67 | ≤74 | PASS |

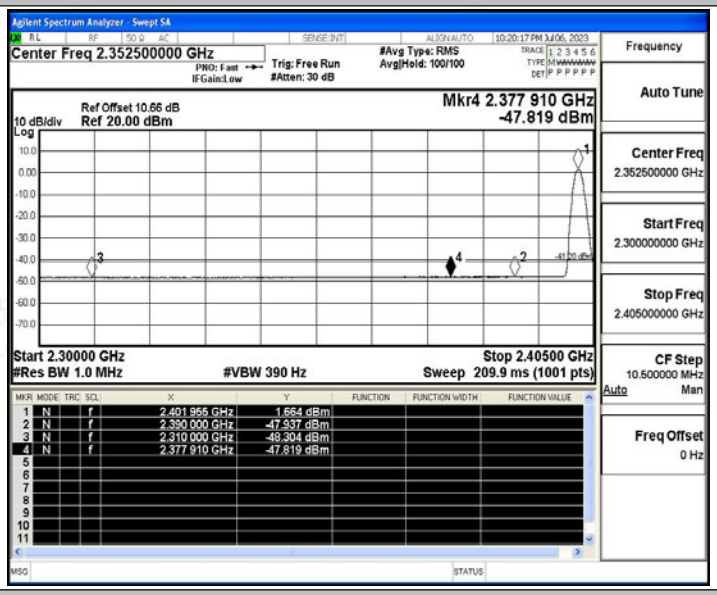
| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Peak | 2500.000 | -39.09 | ≤-21.20 | 56.11 | ≤74 | PASS |
| 3DH5 | Ant1 | Low | 2402 | AV | 2310.000 | -48.29 | ≤-41.20 | 46.91 | ≤54 | PASS |
| | | | | AV | 2388.935 | -47.8 | ≤-41.20 | 47.40 | ≤54 | PASS |
| | | | | AV | 2390.000 | -47.94 | ≤-41.20 | 47.26 | ≤54 | PASS |
| | | | | Peak | 2310.000 | -41.63 | ≤-21.20 | 53.57 | ≤74 | PASS |
| | | | | Peak | 2370.245 | -38.71 | ≤-21.20 | 56.49 | ≤74 | PASS |
| | | | | Peak | 2390.000 | -42.21 | ≤-21.20 | 52.99 | ≤74 | PASS |
| | | High | 2480 | AV | 2483.500 | -47.35 | ≤-41.20 | 47.85 | ≤54 | PASS |
| | | | | AV | 2497.200 | -47.21 | ≤-41.20 | 47.99 | ≤54 | PASS |
| | | | | AV | 2500.000 | -47.43 | ≤-41.20 | 47.77 | ≤54 | PASS |
| | | | | Peak | 2483.500 | -39.42 | ≤-21.20 | 55.78 | ≤74 | PASS |
| | | | | Peak | 2494.960 | -38.36 | ≤-21.20 | 56.84 | ≤74 | PASS |
| | | | | Peak | 2500.000 | -41.94 | ≤-21.20 | 53.26 | ≤74 | PASS |
| | | Low | Hop_2402 | Peak | 2310.000 | -40.47 | ≤-21.20 | 54.73 | ≤74 | PASS |
| | | | | Peak | 2372.660 | -37.86 | ≤-21.20 | 57.34 | ≤74 | PASS |
| | | | | Peak | 2390.000 | -39.35 | ≤-21.20 | 55.85 | ≤74 | PASS |
| | | High | Hop_2480 | Peak | 2483.500 | -40.17 | ≤-21.20 | 55.03 | ≤74 | PASS |
| | | | | Peak | 2489.600 | -37.11 | ≤-21.20 | 58.09 | ≤74 | PASS |
| | | | | Peak | 2500.000 | -38.23 | ≤-21.20 | 56.97 | ≤74 | PASS |

Note：

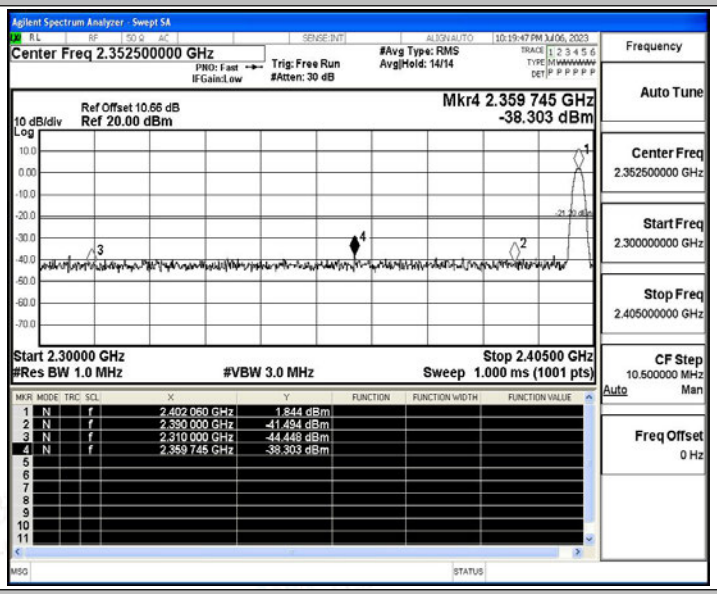
1. The Antenna Gain is compensated in the graph.
2. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

## Test Graphs

DH5_Ant1_Low_2402_AV

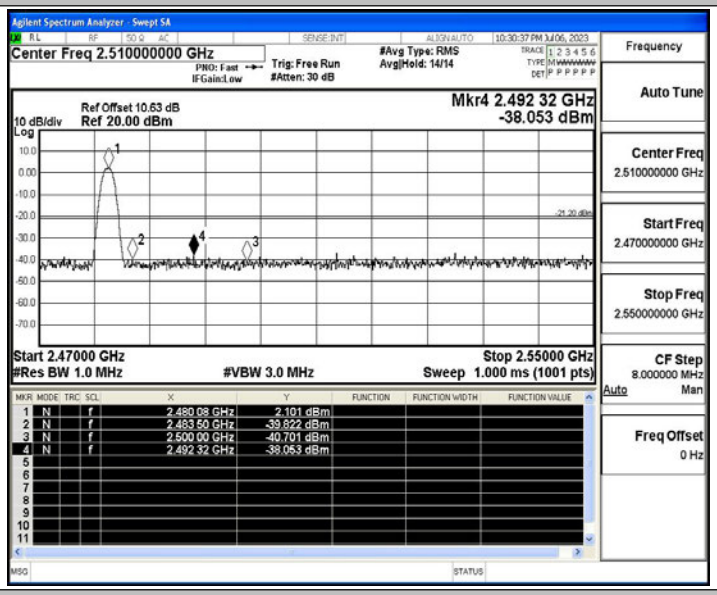



DH5_Ant1_Low_2402_Peak

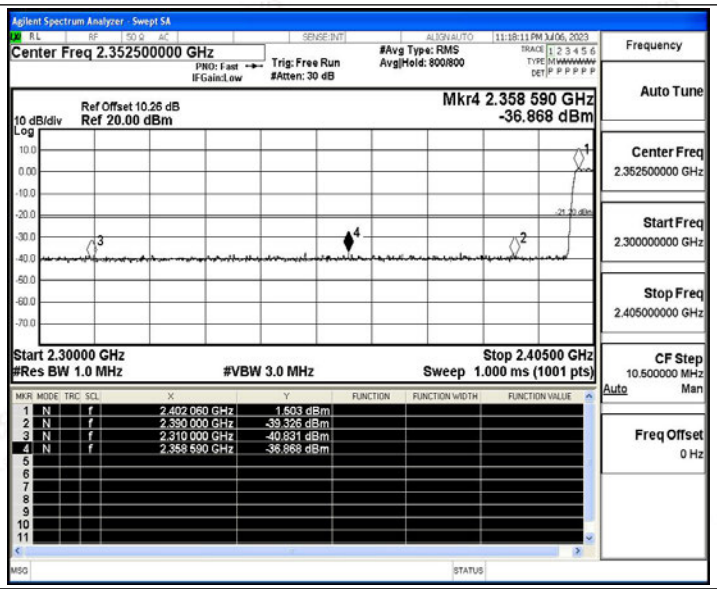



DH5_Ant1_High_2480_AV

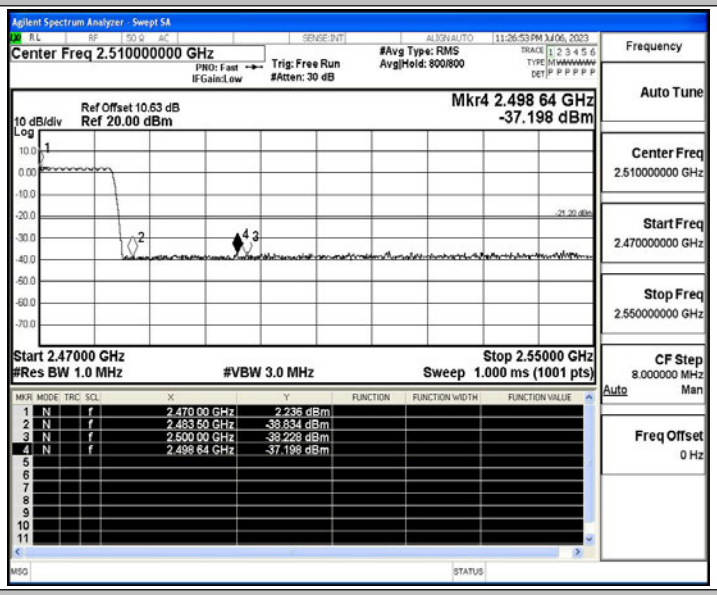
DH5_Ant1_High_2480_Peak



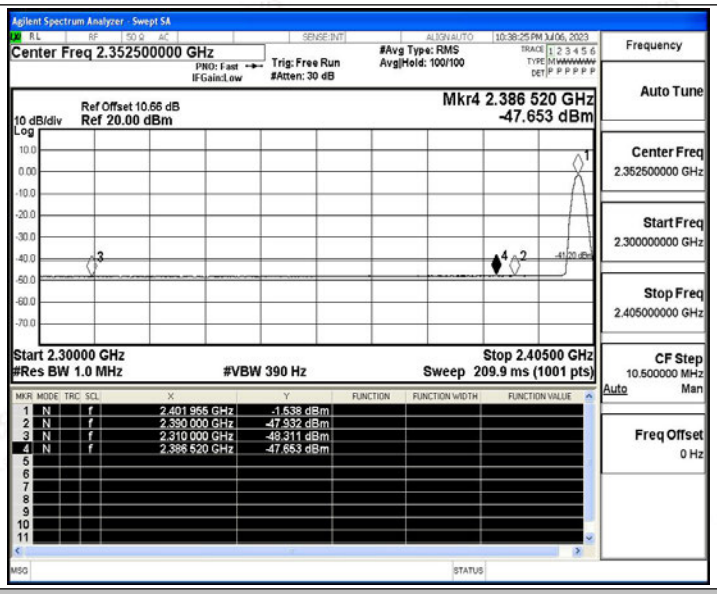

DH5_Ant1_Low_Hop_2402_Peak



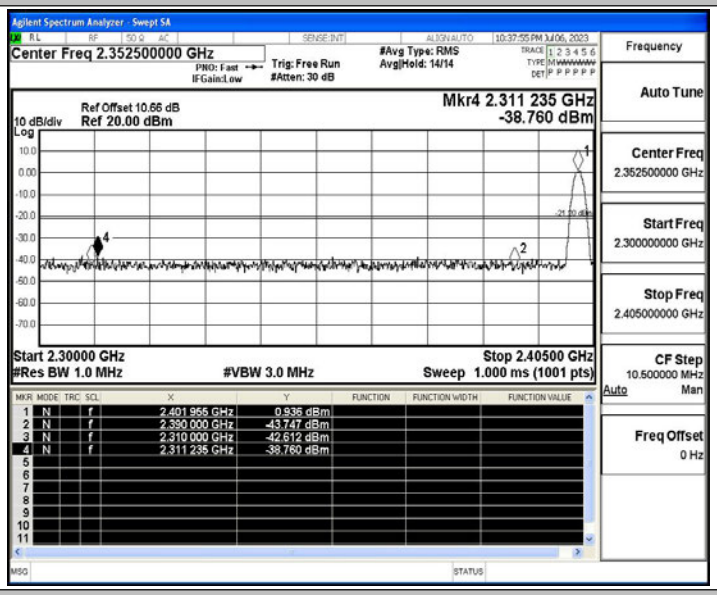

DH5_Ant1_High_Hop_2480_Peak




2DH5_Ant1_Low_2402_AV




2DH5_Ant1_Low_2402_Peak

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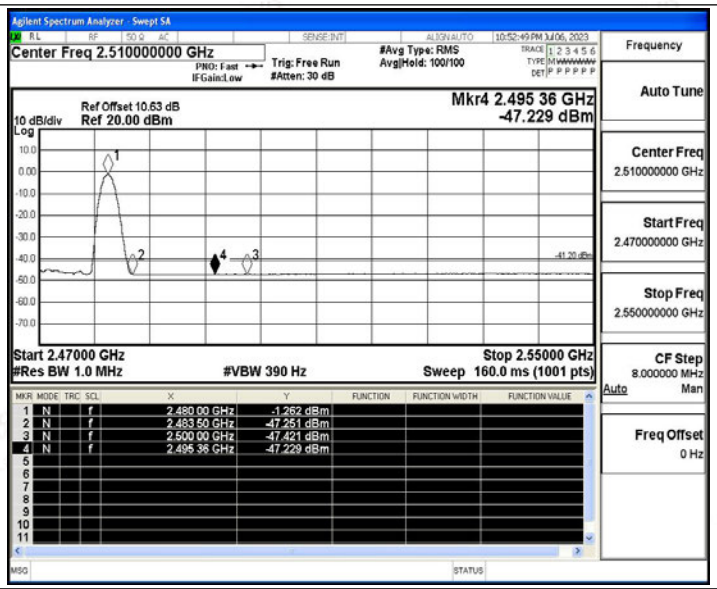


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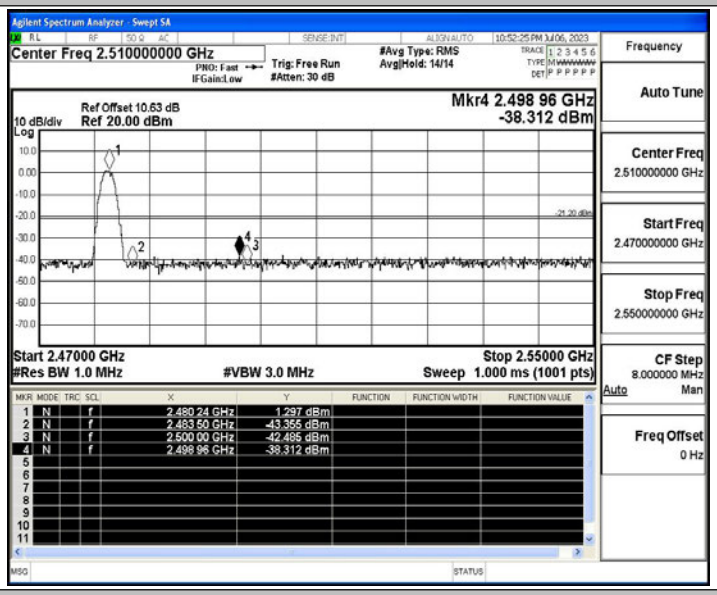
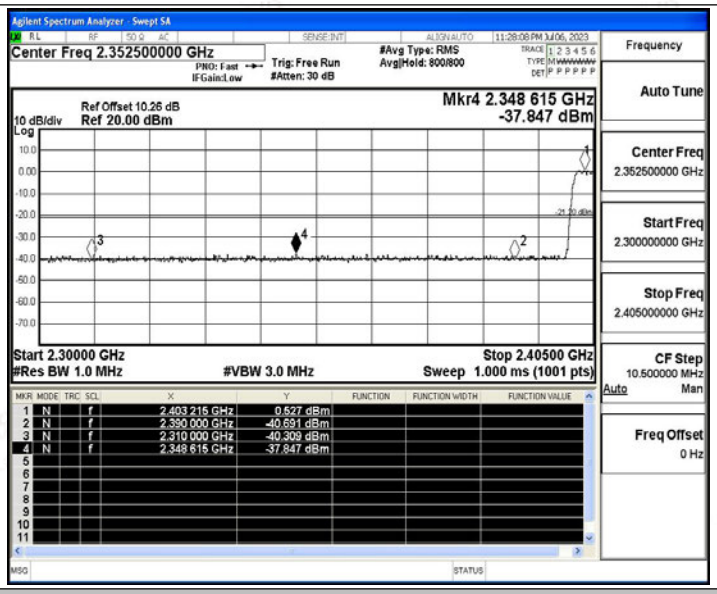
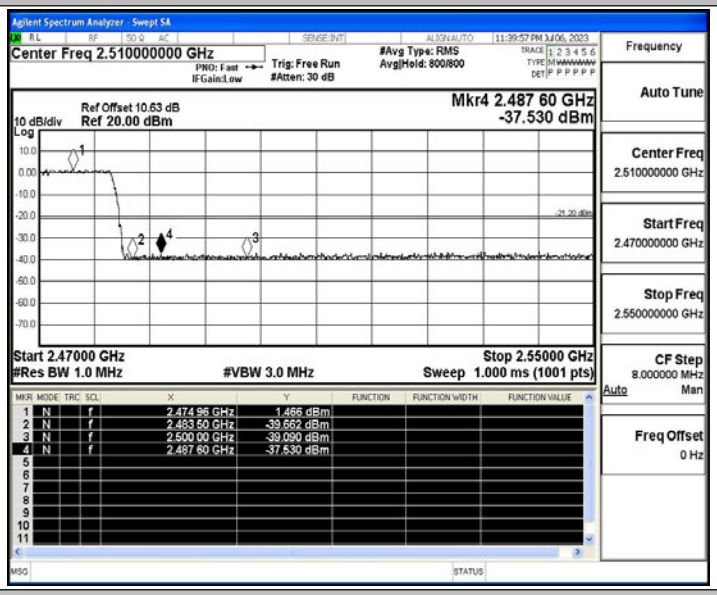


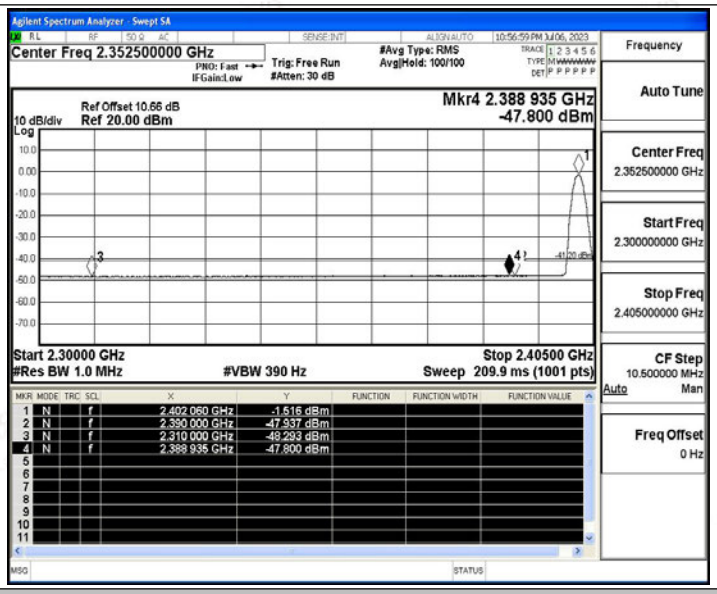

2DH5_Ant1_Low_Hop_2402_Peak



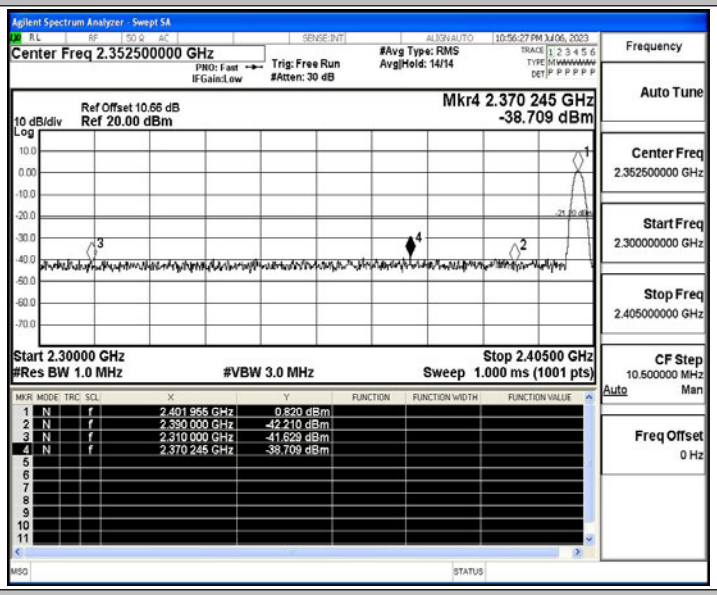

2DH5_Ant1_High_Hop_2480_Peak




3DH5_Ant1_Low_2402_AV




3DH5_Ant1_Low_2402_Peak

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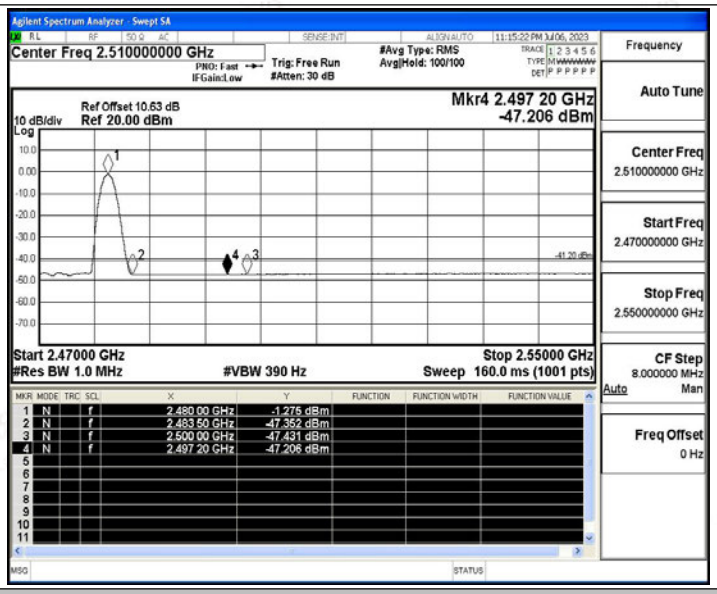


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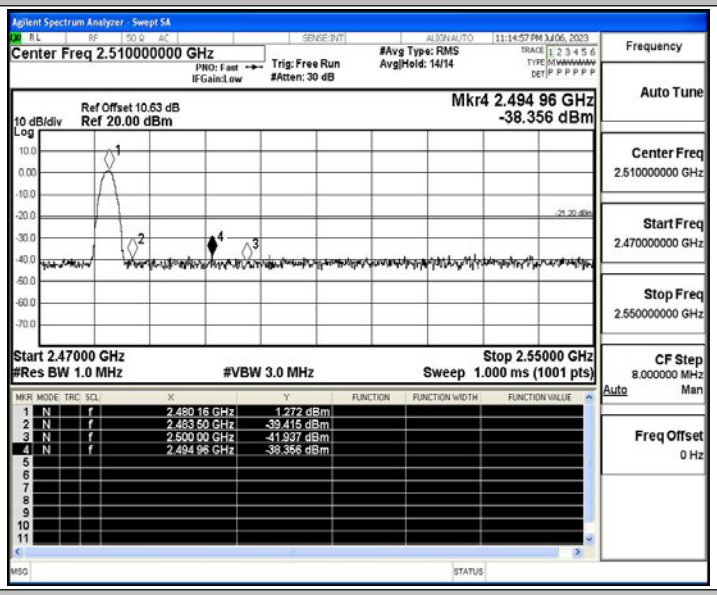
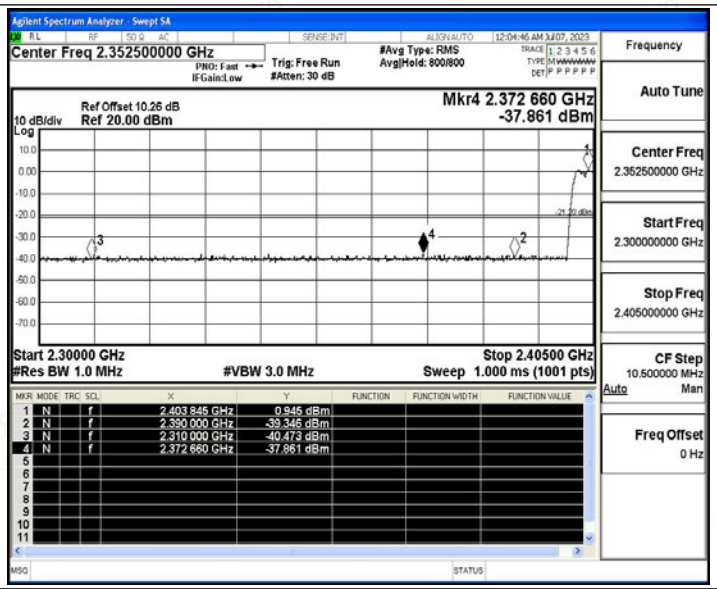
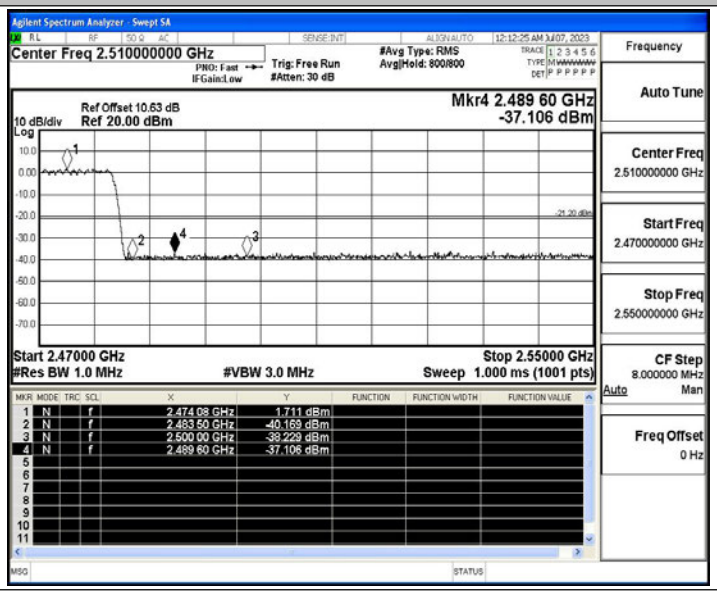



3DH5_Ant1_Low_Hop_2402_Peak




3DH5_Ant1_High_Hop_2480_Peak