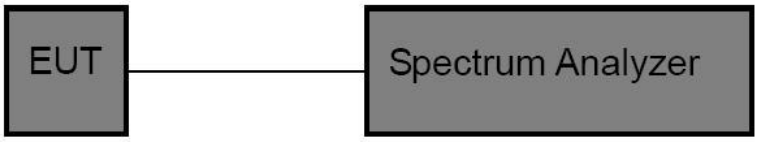
9 20DB Occupy Bandwidth Test

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℃
Test Result	:	PASS	Humidity	:	55%RH

L：

TestMode	Antenna	Frequency[MHz]	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.957	2401.538	2402.495	---	---
DH5	Ant1	2441	0.960	2440.535	2441.495	---	---
DH5	Ant1	2480	0.963	2479.535	2480.498	---	---
2DH5	Ant1	2402	1.275	2401.376	2402.651	---	---
2DH5	Ant1	2441	1.290	2440.367	2441.657	---	---
2DH5	Ant1	2480	1.320	2479.340	2480.660	---	---
3DH5	Ant1	2402	1.287	2401.361	2402.648	---	---
3DH5	Ant1	2441	1.278	2440.352	2441.630	---	---
3DH5	Ant1	2480	1.311	2479.349	2480.660	---	---

R：

TestMode	Antenna	Frequency[MHz]	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.960	2401.541	2402.501	---	---
DH5	Ant1	2441	0.960	2440.541	2441.501	---	---
DH5	Ant1	2480	0.957	2479.544	2480.501	---	---
2DH5	Ant1	2402	1.287	2401.373	2402.660	---	---
2DH5	Ant1	2441	1.275	2440.382	2441.657	---	---
2DH5	Ant1	2480	1.308	2479.352	2480.660	---	---
3DH5	Ant1	2402	1.299	2401.361	2402.660	---	---
3DH5	Ant1	2441	1.299	2440.358	2441.657	---	---
3DH5	Ant1	2480	1.290	2479.364	2480.654	---	---

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

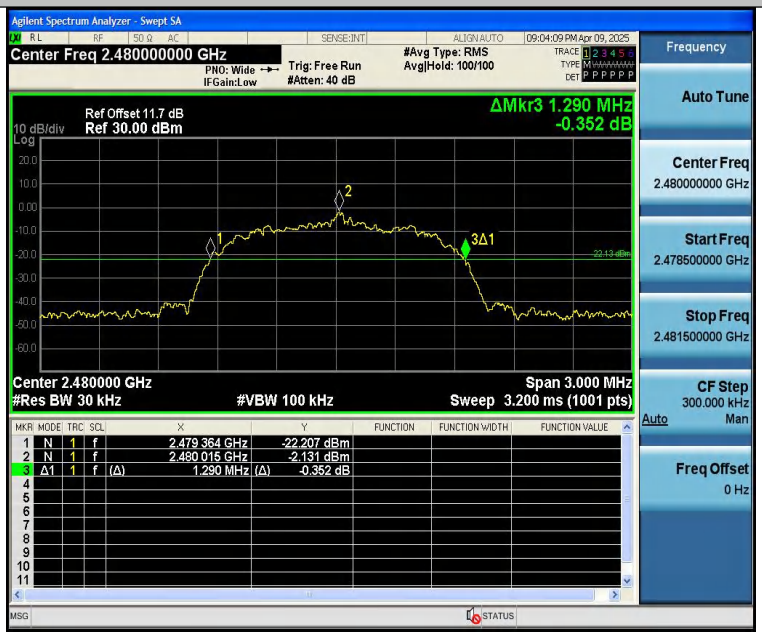
2DH5-Ant1-2441

2DH5-Ant1-2480

3DH5-Ant1-2402

3DH5-Ant1-2441

3DH5-Ant1-2480

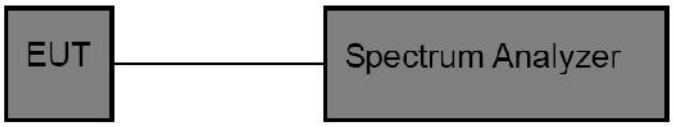


10 Carrier Frequency Separation Test

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℃
Test Result	:	PASS	Humidity	:	55%RH

L：

TestMode	Antenna	Frequency[MHz]	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant1	Hop	1.18	≥0.642	PASS
2DH5	Ant1	Hop	1.322	≥0.880	PASS
3DH5	Ant1	Hop	1.012	≥0.874	PASS

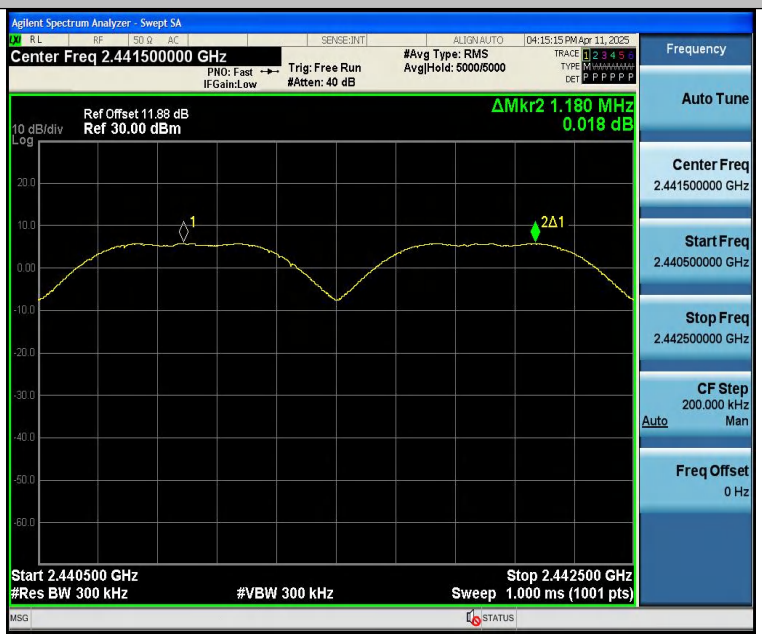
R：

TestMode	Antenna	Frequency[MHz]	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant1	Hop	0.858	≥0.640	PASS
2DH5	Ant1	Hop	1.04	≥0.872	PASS
3DH5	Ant1	Hop	0.81	≥0.866	PASS

Test Graphs:

L：

DH5-Ant1-Hop-PASS

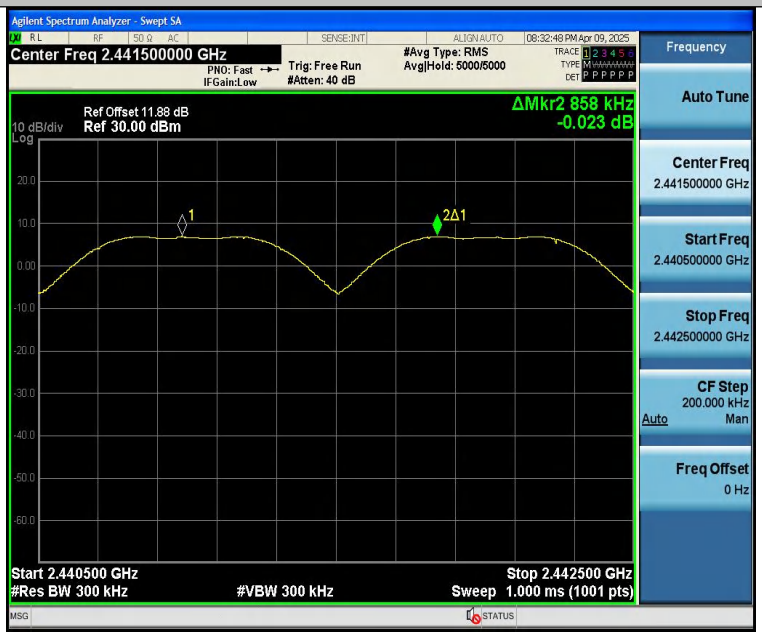


2DH5-Ant1-Hop-PASS

3DH5-Ant1-Hop-PASS

R:

DH5-Ant1-Hop-PASS



2DH5-Ant1-Hop-PASS

3DH5-Ant1-Hop-PASS

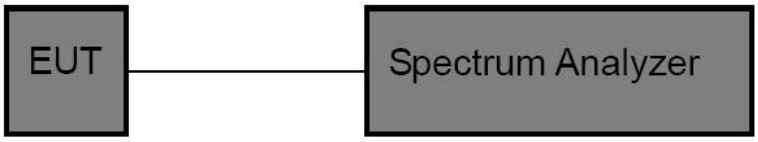

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.441500000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 5000/5000
08:34:00 PM Apr 09, 2025
Ref Offset 11.88 dB
10 dB/div
Log
Ref 30.00 dBm
ΔMkr2 810 kHz
0.036 dB
1
2Δ1
Start 2.440500 GHz
#Res BW 300 kHz
#VBW 300 kHz
Stop 2.442500 GHz
Sweep 1.000 ms (1001 pts)
Frequency
Auto Tune
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
MSG
STATUS

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℃
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

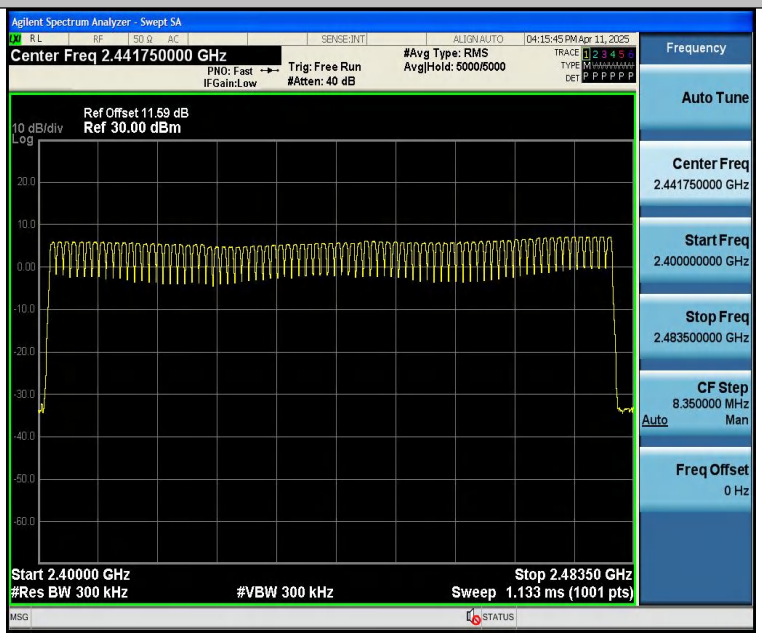
R:

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

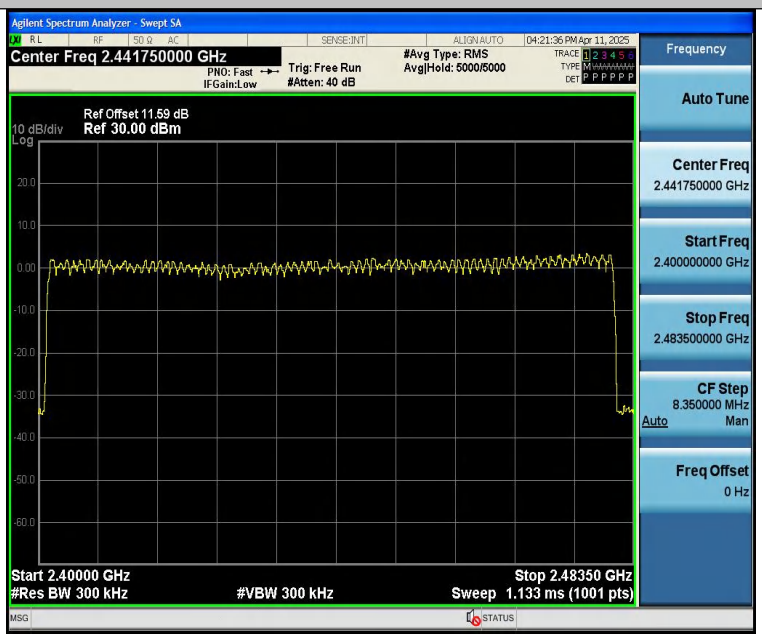
Test Graphs:

L:

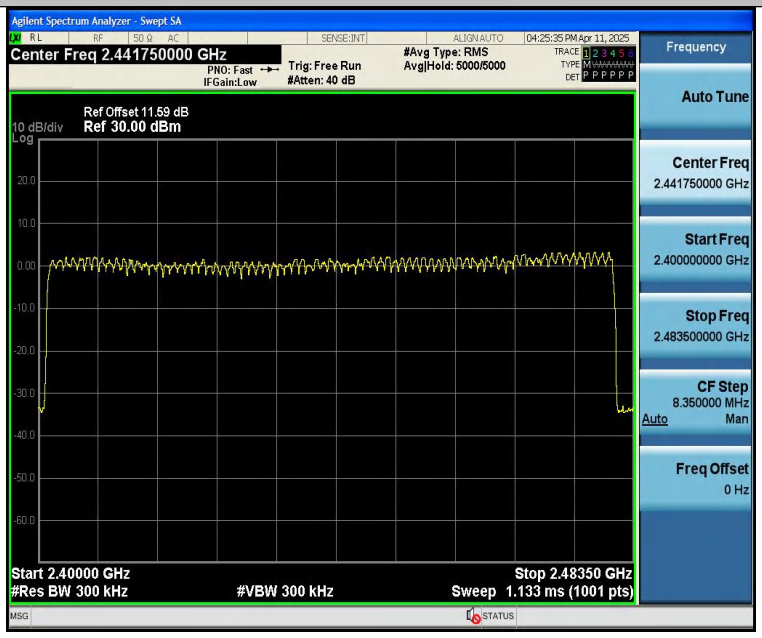
DH5-Ant1-Hop-PASS



2DH5-Ant1-Hop-PASS

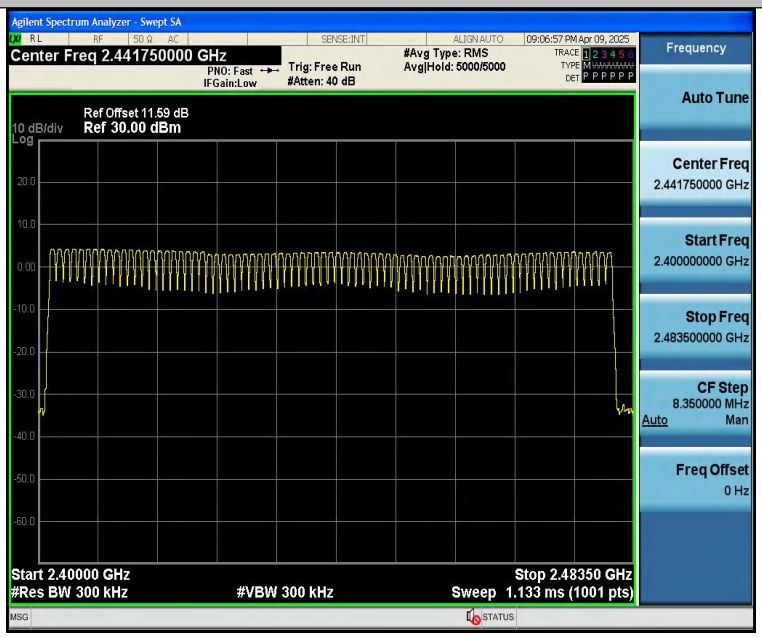


3DH5-Ant1-Hop-PASS

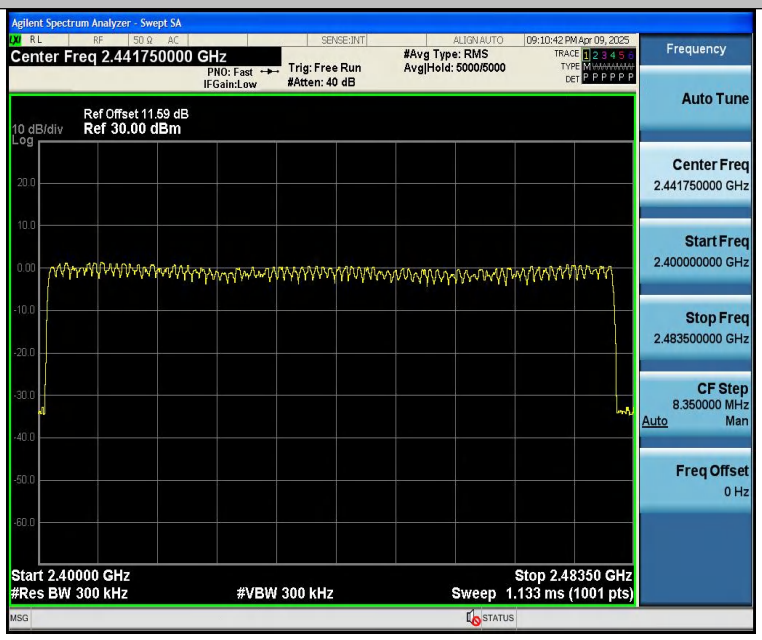


R:

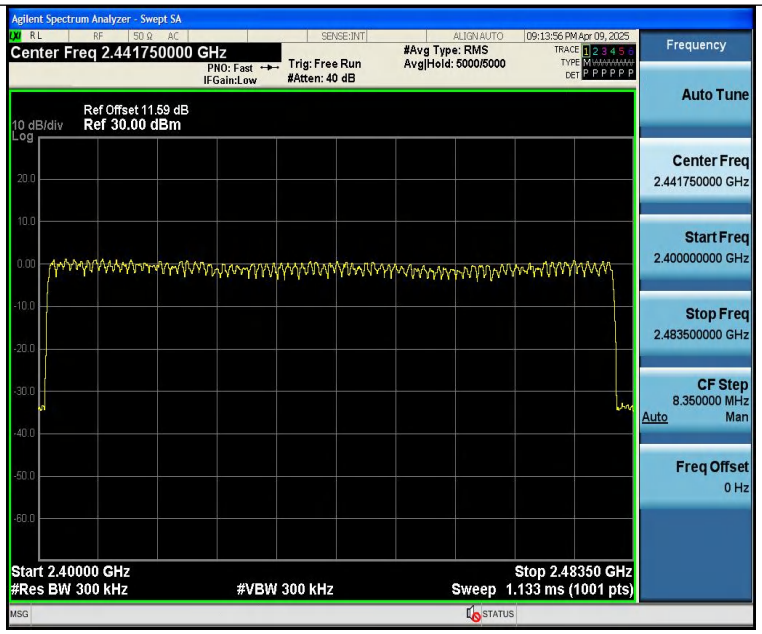
DH5-Ant1-Hop-PASS



2DH5-Ant1-Hop-PASS



3DH5-Ant1-Hop-PASS

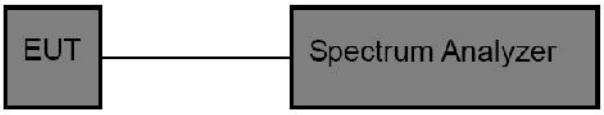

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.441750000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 5000/5000
09:13:56 PM Apr 09, 2025
Ref Offset 11.59 dB
10 dB/div
Log
Ref 30.00 dBm
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
Start 2.40000 GHz
#Res BW 300 kHz
#VBW 300 kHz
Stop 2.48350 GHz
Sweep 1.133 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
MSG
STATUS

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 Mode	:	CH Low ~ CH High
Test Voltage	:	3.7V	Temperature	:	24.5℃
Test Result	:	PASS	Humidity	:	55%RH

L:

TestMode	Antenna	Frequency[MHz]	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH5	Ant1	Hop	2.885	106.67	0.308	≤0.4	PASS
2DH5	Ant1	Hop	2.889	106.67	0.308	≤0.4	PASS
3DH5	Ant1	Hop	2.892	106.67	0.308	≤0.4	PASS
DH1	Ant1	Hop	0.380	320	0.122	≤0.4	PASS
2DH1	Ant1	Hop	0.390	320	0.125	≤0.4	PASS
3DH1	Ant1	Hop	0.389	320	0.124	≤0.4	PASS
DH3	Ant1	Hop	1.638	160	0.262	≤0.4	PASS
2DH3	Ant1	Hop	1.642	160	0.263	≤0.4	PASS
3DH3	Ant1	Hop	1.642	160	0.263	≤0.4	PASS

R:

TestMode	Antenna	Frequency[MHz]	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH5	Ant1	Hop	2.885	106.67	0.308	≤0.4	PASS
2DH5	Ant1	Hop	2.891	106.67	0.308	≤0.4	PASS
3DH5	Ant1	Hop	2.892	106.67	0.308	≤0.4	PASS
DH1	Ant1	Hop	0.381	320	0.122	≤0.4	PASS
2DH1	Ant1	Hop	0.390	320	0.125	≤0.4	PASS
3DH1	Ant1	Hop	0.390	320	0.125	≤0.4	PASS
DH3	Ant1	Hop	1.638	160	0.262	≤0.4	PASS
2DH3	Ant1	Hop	1.642	160	0.263	≤0.4	PASS
3DH3	Ant1	Hop	1.640	160	0.262	≤0.4	PASS

Note:

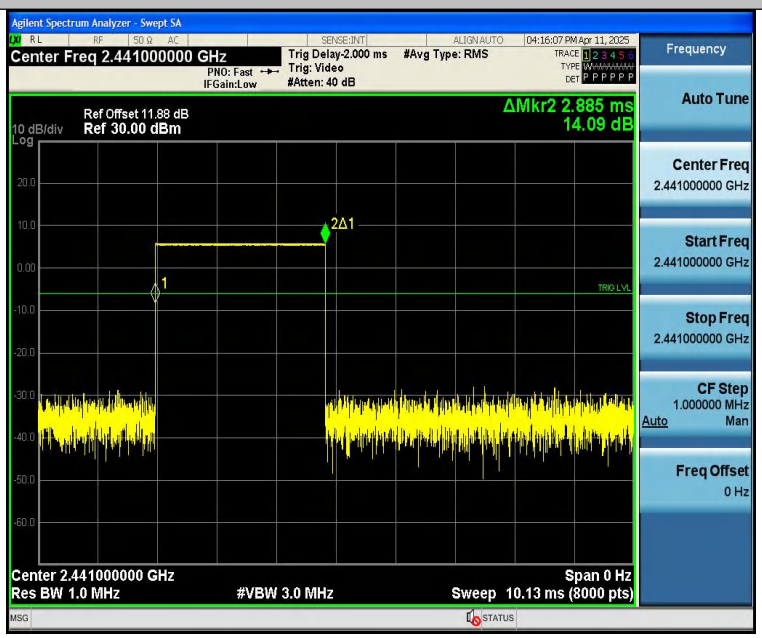
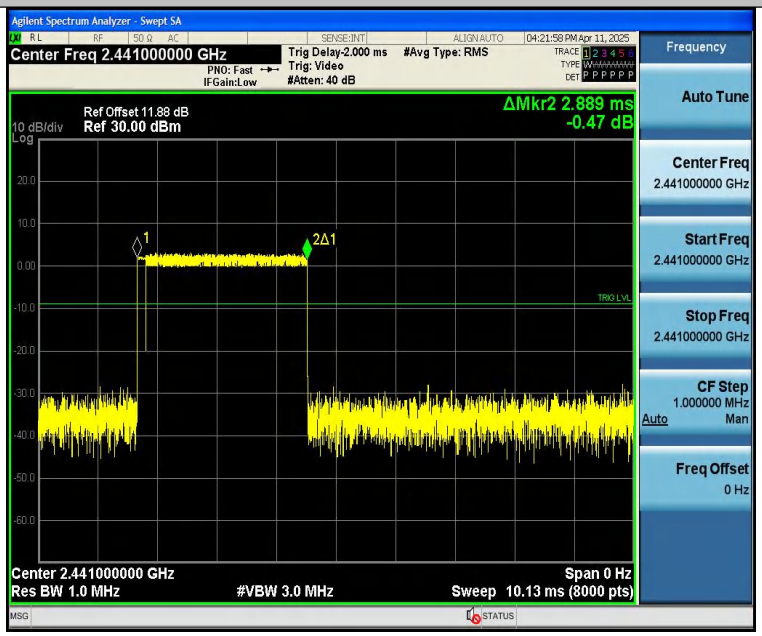
1.DH1/2DH1/3DH1 Dwell Time: Reading * (1600/2)*31.6/(channel number).

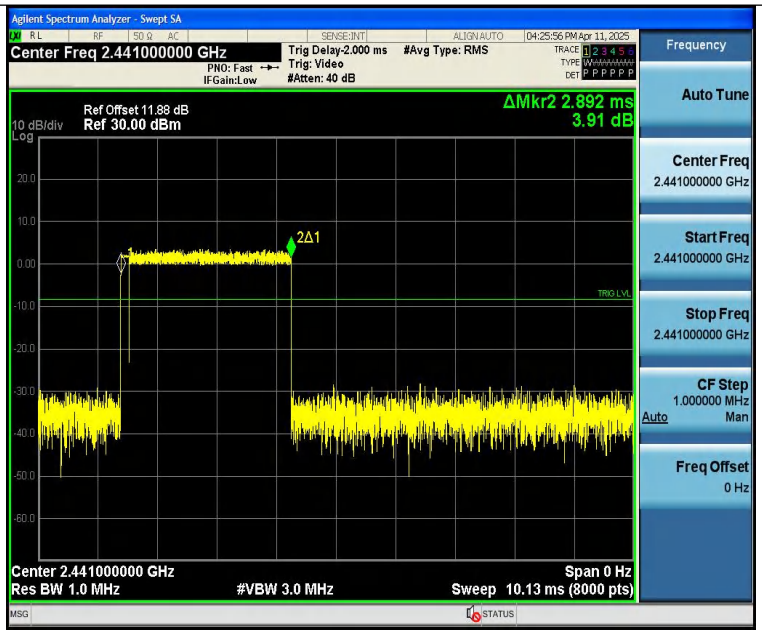
2.DH3/2DH3/3DH3 Dwell Time: Reading * (1600/4)*31.6/(channel number).

3.DH5/2DH5/3DH5 Dwell Time: Reading * (1600/6)*31.6/(channel number).

Test Graphs:

L:

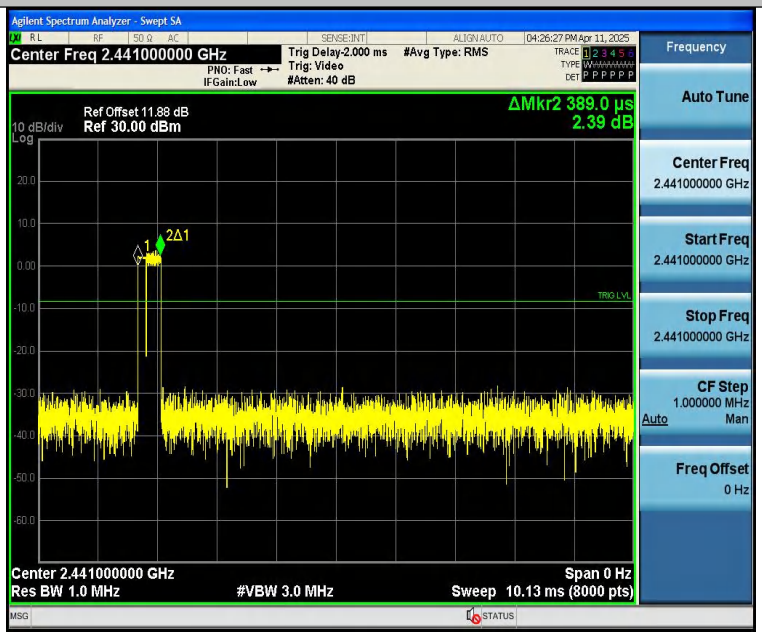
DH5-Ant1-Hop-PASS

2DH5-Ant1-Hop-PASS

3DH5-Ant1-Hop-PASS



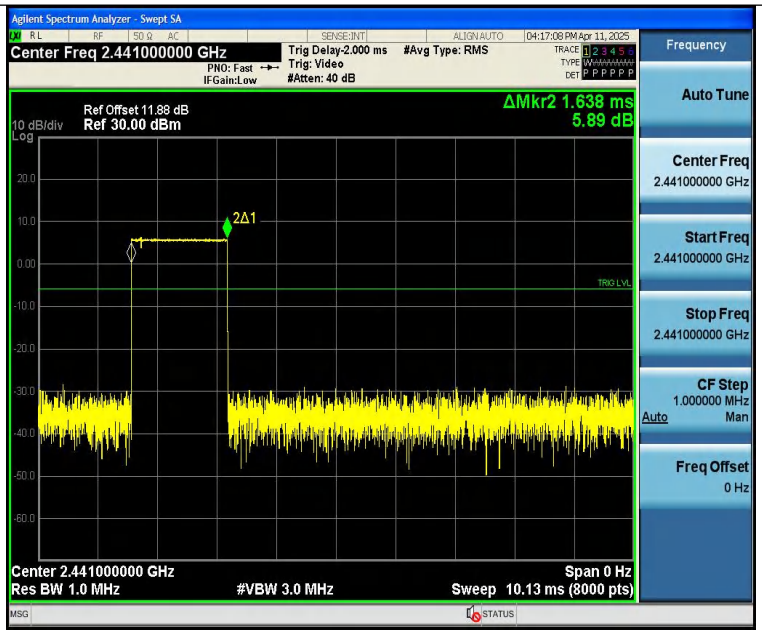
DH1-Ant1-Hop-PASS

2DH1-Ant1-Hop-PASS

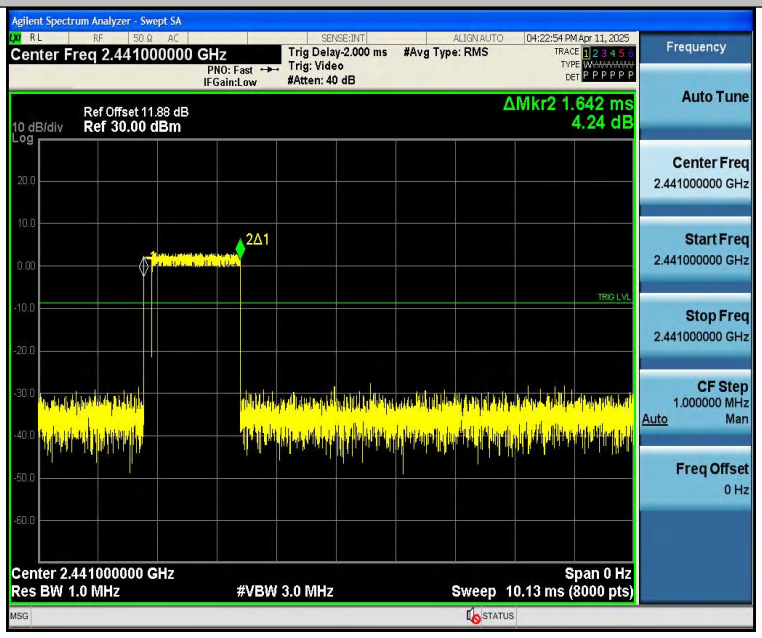
3DH1-Ant1-Hop-PASS



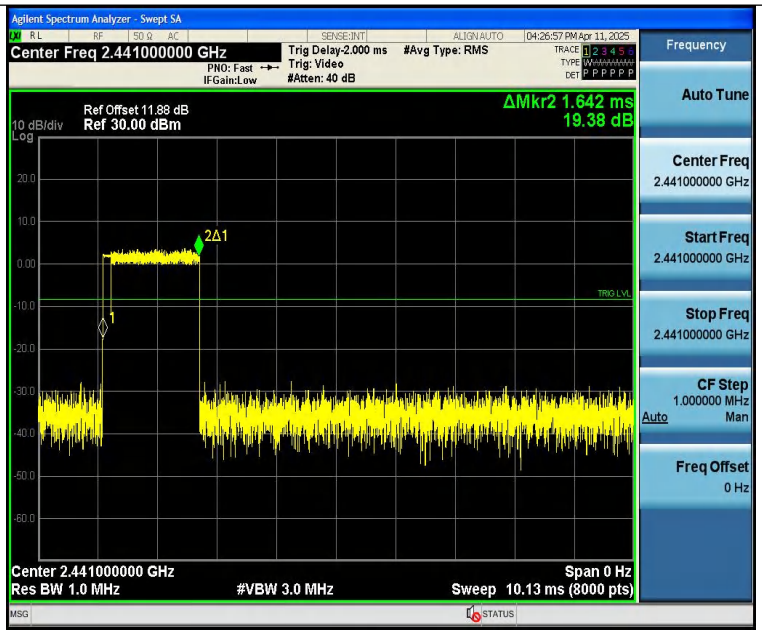
DH3-Ant1-Hop-PASS



2DH3-Ant1-Hop-PASS



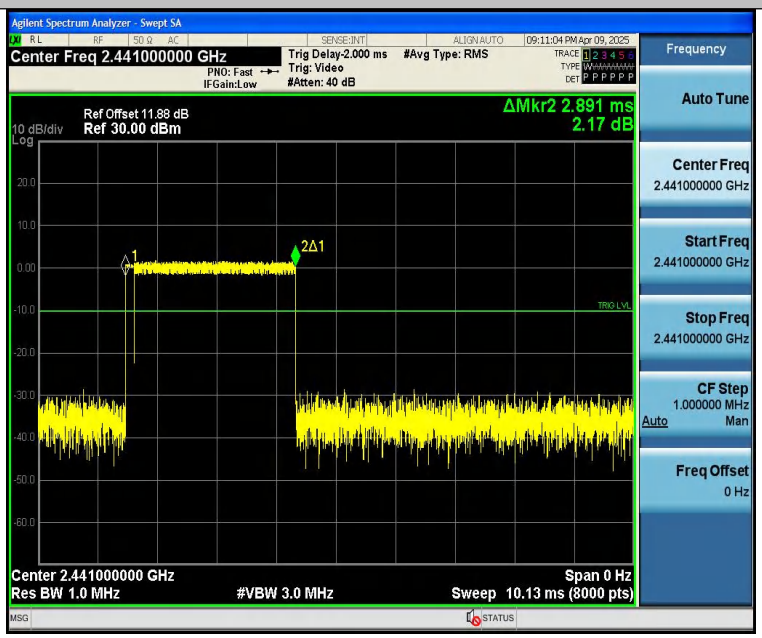
3DH3-Ant1-Hop-PASS



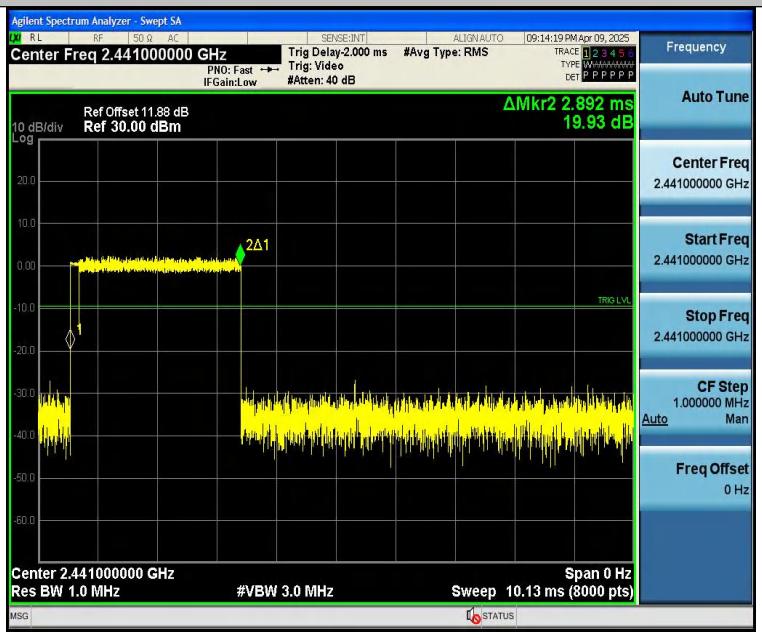
R:

DH5-Ant1-Hop-PASS

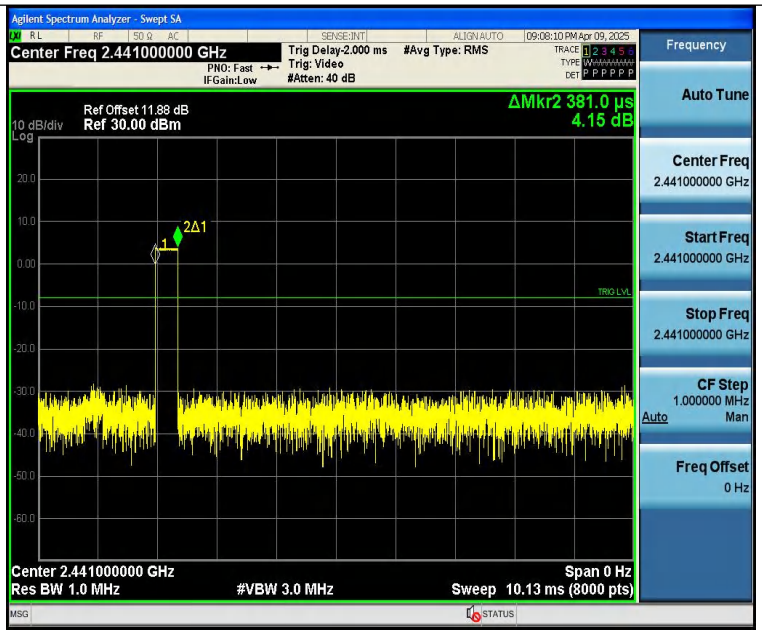
2DH5-Ant1-Hop-PASS



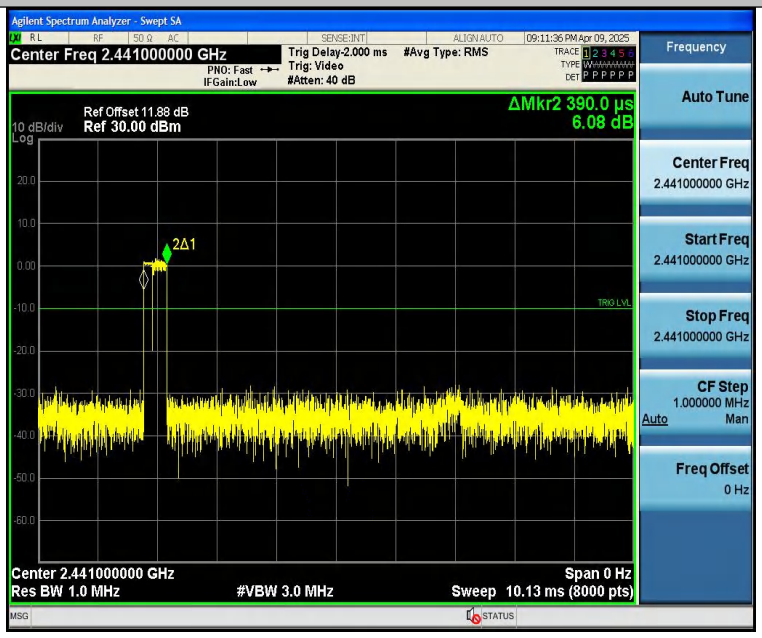
3DH5-Ant1-Hop-PASS



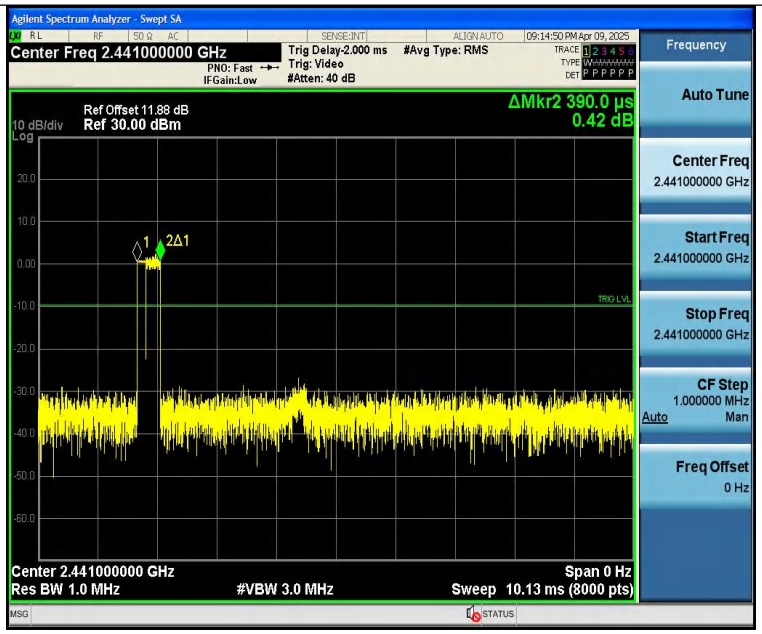
DH1-Ant1-Hop-PASS



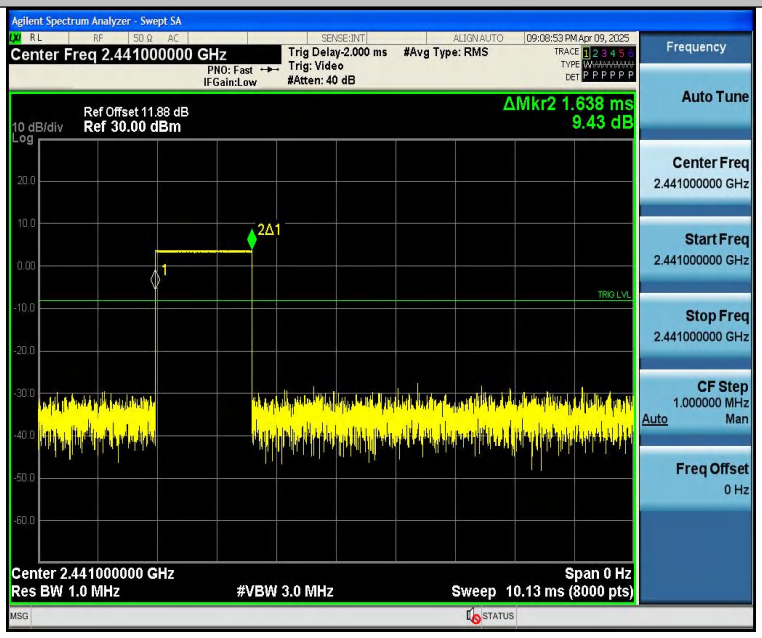
2DH1-Ant1-Hop-PASS



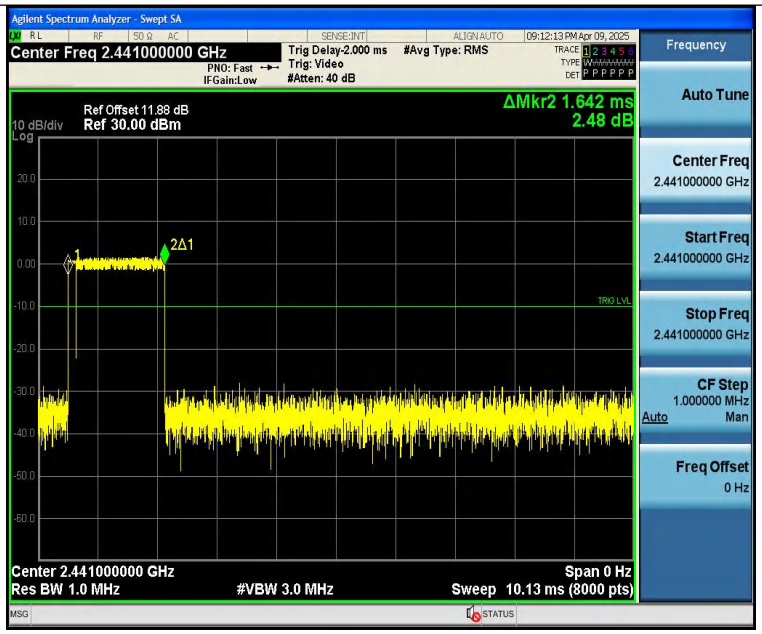
3DH1-Ant1-Hop-PASS



DH3-Ant1-Hop-PASS



2DH3-Ant1-Hop-PASS



3DH3-Ant1-Hop-PASS