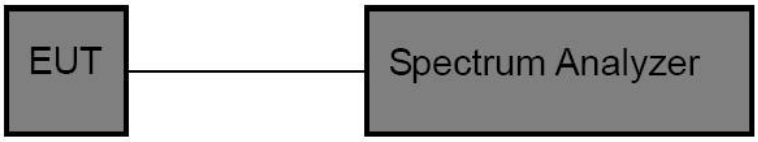
9 20DB Occupy Bandwidth Test

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	:	AC 120V	Temperature	:	24.5℃
Test Result	:	PASS	Humidity	:	55%RH

Ant0:

TestMode	Antenna	Frequency[MHz]	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant0	2402	0.963	2401.538	2402.501	---	---
DH5	Ant0	2441	0.942	2440.541	2441.483	---	---
DH5	Ant0	2480	0.960	2479.541	2480.501	---	---
2DH5	Ant0	2402	1.272	2401.379	2402.651	---	---
2DH5	Ant0	2441	1.275	2440.373	2441.648	---	---
2DH5	Ant0	2480	1.272	2479.376	2480.648	---	---
3DH5	Ant0	2402	1.296	2401.361	2402.657	---	---
3DH5	Ant0	2441	1.308	2440.352	2441.660	---	---
3DH5	Ant0	2480	1.314	2479.346	2480.660	---	---

Ant2:

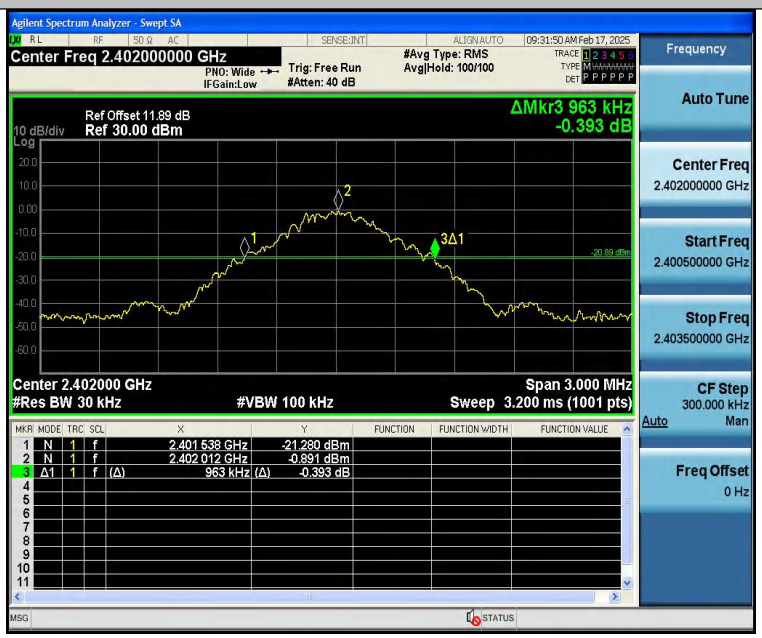
TestMode	Antenna	Frequency[MHz]	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant2	2402	0.957	2401.538	2402.495	---	---
DH5	Ant2	2441	0.960	2440.535	2441.495	---	---
DH5	Ant2	2480	0.951	2479.538	2480.489	---	---
2DH5	Ant2	2402	1.284	2401.373	2402.657	---	---
2DH5	Ant2	2441	1.284	2440.370	2441.654	---	---
2DH5	Ant2	2480	1.314	2479.346	2480.660	---	---
3DH5	Ant2	2402	1.314	2401.349	2402.663	---	---
3DH5	Ant2	2441	1.296	2440.355	2441.651	---	---
3DH5	Ant2	2480	1.296	2479.355	2480.651	---	---

Ant4:

TestMode	Antenna	Frequency[MHz]	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant4	2402	0.954	2401.535	2402.489	---	---
DH5	Ant4	2441	0.963	2440.538	2441.501	---	---
DH5	Ant4	2480	0.954	2479.538	2480.492	---	---
2DH5	Ant4	2402	1.275	2401.373	2402.648	---	---
2DH5	Ant4	2441	1.281	2440.376	2441.657	---	---
2DH5	Ant4	2480	1.314	2479.349	2480.663	---	---
3DH5	Ant4	2402	1.284	2401.361	2402.645	---	---
3DH5	Ant4	2441	1.335	2440.337	2441.672	---	---
3DH5	Ant4	2480	1.299	2479.352	2480.651	---	---

Ant0:

DH5-Ant0-2402



DH5-Ant0-2441

DH5-Ant0-2480

2DH5-Ant0-2402

2DH5-Ant0-2441

2DH5-Ant0-2480

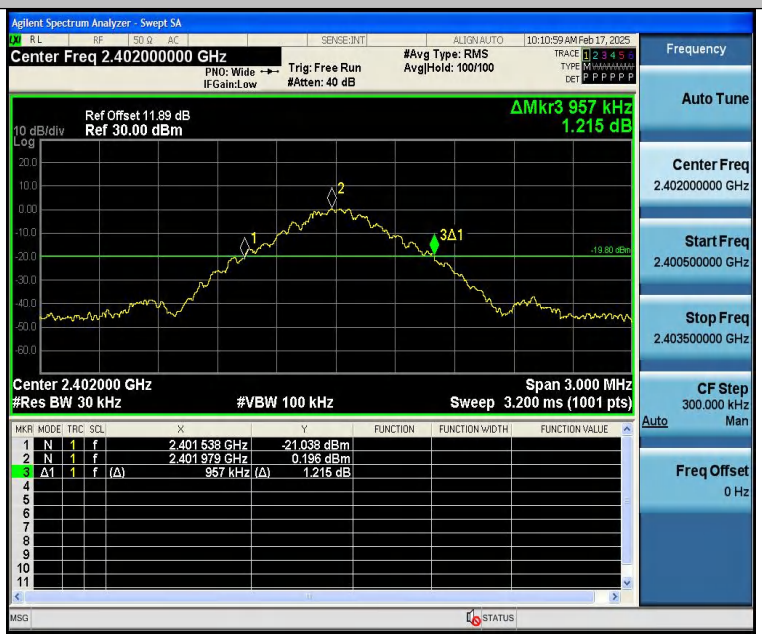
3DH5-Ant0-2402

3DH5-Ant0-2441

3DH5-Ant0-2480

Ant2:

DH5-Ant2-2402



DH5-Ant2-2441

DH5-Ant2-2480

2DH5-Ant2-2402

2DH5-Ant2-2441

2DH5-Ant2-2480

3DH5-Ant2-2402

3DH5-Ant2-2441

3DH5-Ant2-2480

Ant4

DH5-Ant4-2402

DH5-Ant4-2441

DH5-Ant4-2480

2DH5-Ant4-2402

2DH5-Ant4-2441

2DH5-Ant4-2480

3DH5-Ant4-2402

3DH5-Ant4-2441

3DH5-Ant4-2480

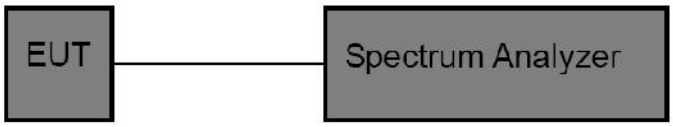
Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 100/100
11:06:13 AM Feb 17, 2025
Ref Offset 11.7 dB
10 dB/div
Ref 30.00 dBm
Log
ΔMkr3 1.299 MHz
-0.508 dB
-22.24 dBm
Center 2.480000 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3.000 MHz
Sweep 3.200 ms (1001 pts)
1 N 1 f 2.479 352 GHz -22.794 dBm
2 N 1 f 2.480 003 GHz -2.237 dBm
3 Δ1 1 f (Δ) 1.299 MHz (Δ) -0.508 dB
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.478500000 GHz
Stop Freq
2.481500000 GHz
CF Step
300.000 kHz
Auto
Man
Freq Offset
0 Hz

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	:	AC 120V	Temperature	:	24.5℃
Test Result	:	PASS	Humidity	:	55%RH

Ant0:

TestMode	Antenna	Frequency[MHz]	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant0	Hop	0.982	≥0.642	PASS
2DH5	Ant0	Hop	1.19	≥0.850	PASS
3DH5	Ant0	Hop	0.992	≥0.876	PASS

Ant2:

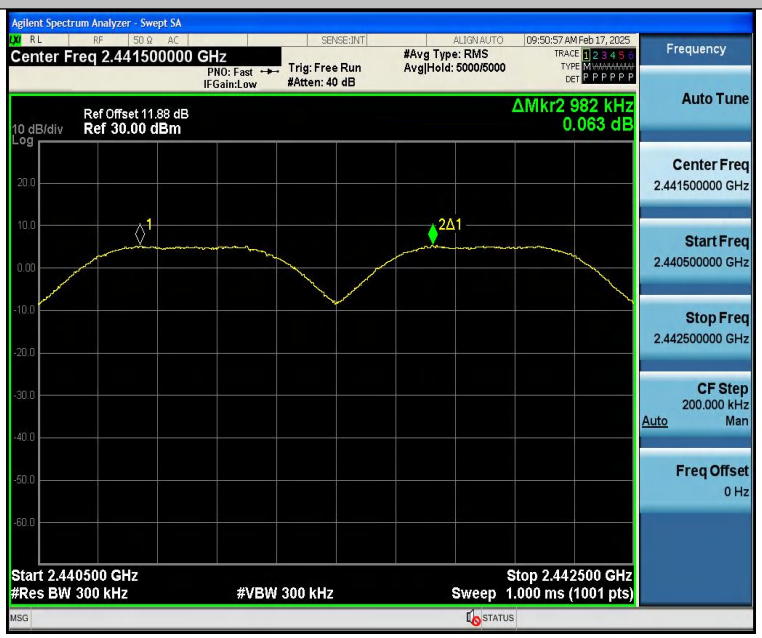
TestMode	Antenna	Frequency[MHz]	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant2	Hop	1.17	≥0.640	PASS
2DH5	Ant2	Hop	1.19	≥0.876	PASS
3DH5	Ant2	Hop	1.014	≥0.876	PASS

Ant4:

TestMode	Antenna	Frequency[MHz]	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant4	Hop	1.188	≥0.642	PASS
2DH5	Ant4	Hop	0.898	≥0.876	PASS
3DH5	Ant4	Hop	1.012	≥0.890	PASS

Ant0:

DH5-Ant0-Hop-PASS

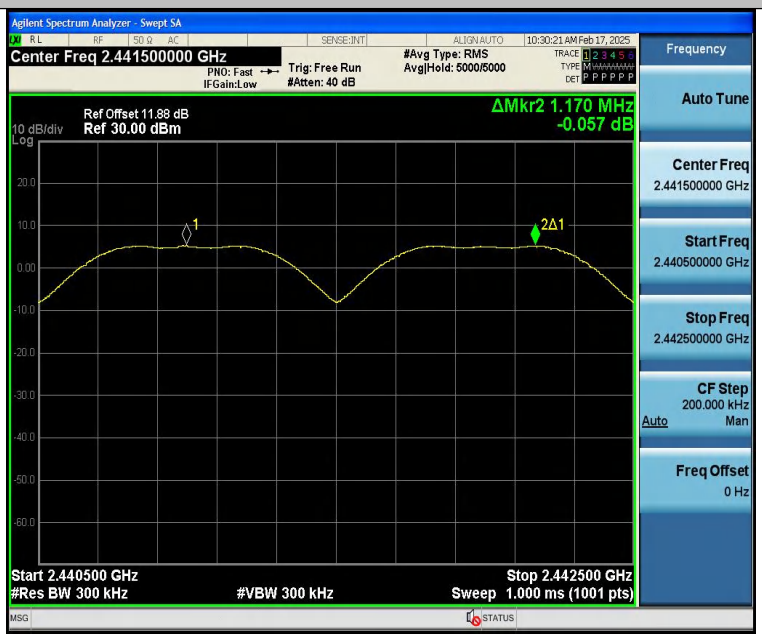


2DH5-Ant0-Hop-PASS

3DH5-Ant0-Hop-PASS

Ant2:

DH5-Ant2-Hop-PASS

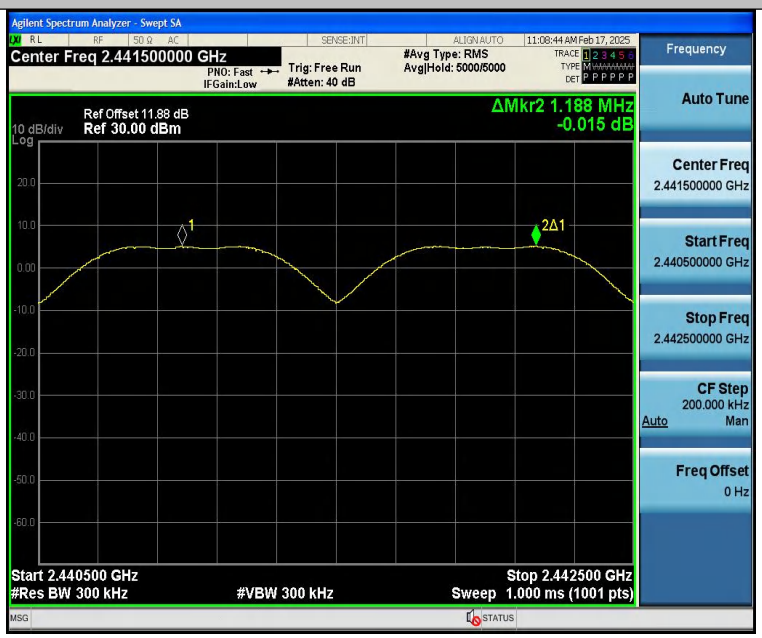


2DH5-Ant2-Hop-PASS

3DH5-Ant2-Hop-PASS

Ant4

DH5-Ant4-Hop-PASS



2DH5-Ant4-Hop-PASS

3DH5-Ant4-Hop-PASS

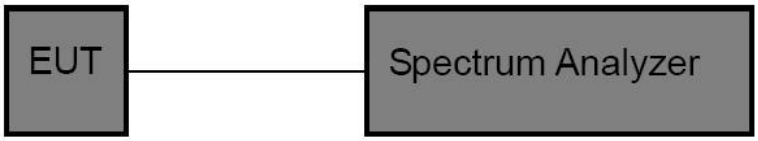
Agilent Spectrum Analyzer - Swept SA
Center Freq 2.441500000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 5000/5000
11:16:32 AM Feb 17, 2025
Ref Offset 11.88 dB
10 dB/div
Ref 30.00 dBm
Log
ΔMkr2 1.012 MHz
0.056 dB
Start 2.440500 GHz
#Res BW 300 kHz
#VBW 300 kHz
Stop 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

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	:	AC 120V	Temperature	:	24.5℃
Test Result	:	PASS	Humidity	:	55%RH

Ant0:

TestMode	Antenna	Frequency[MHz]	Result[Num]	Limit[Num]	Verdict
DH5	Ant0	Hop	79	≥15	PASS
2DH5	Ant0	Hop	79	≥15	PASS
3DH5	Ant0	Hop	79	≥15	PASS

Ant2:

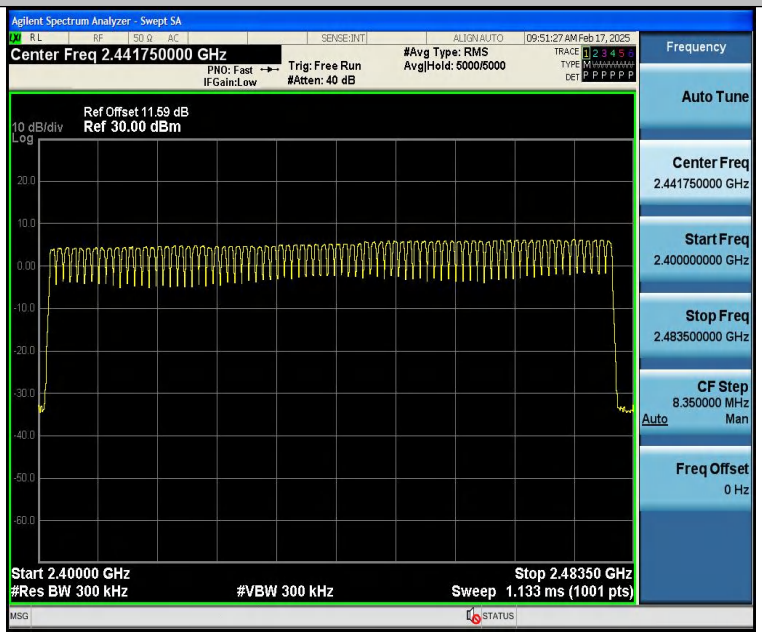
TestMode	Antenna	Frequency[MHz]	Result[Num]	Limit[Num]	Verdict
DH5	Ant2	Hop	79	≥15	PASS
2DH5	Ant2	Hop	79	≥15	PASS
3DH5	Ant2	Hop	79	≥15	PASS

Ant4:

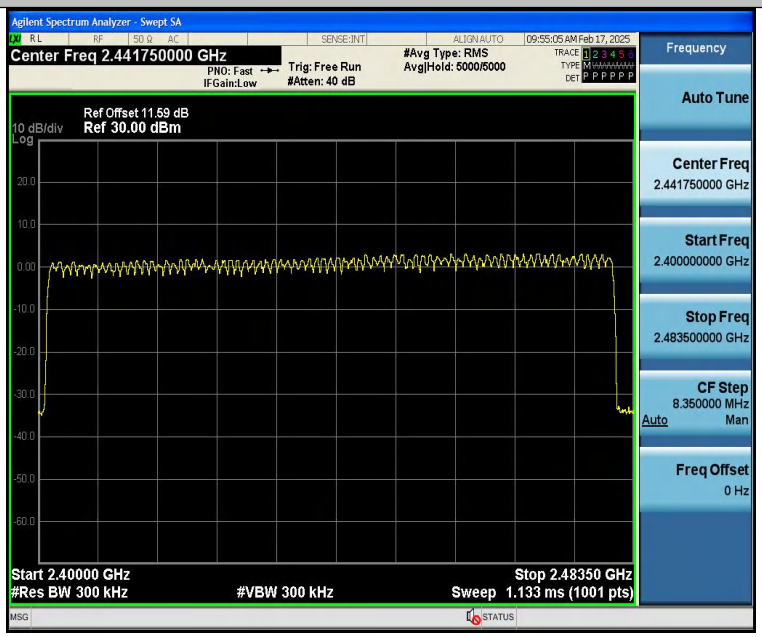
TestMode	Antenna	Frequency[MHz]	Result[Num]	Limit[Num]	Verdict
DH5	Ant4	Hop	79	≥15	PASS
2DH5	Ant4	Hop	79	≥15	PASS
3DH5	Ant4	Hop	79	≥15	PASS

Ant0:

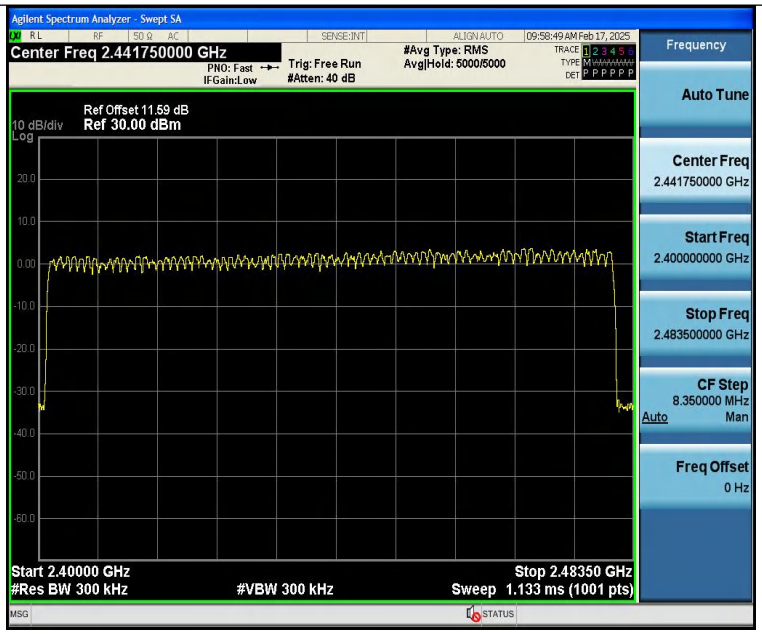
DH5-Ant0-Hop-PASS



2DH5-Ant0-Hop-PASS

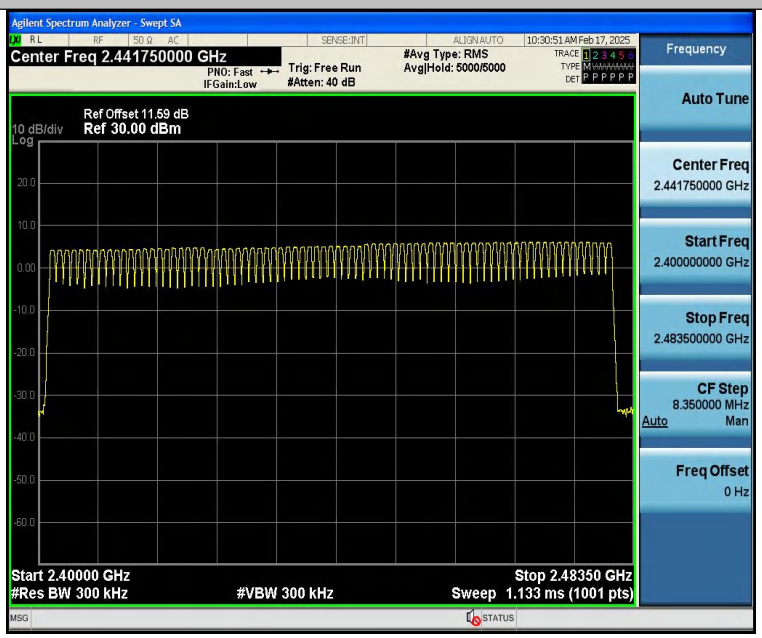


3DH5-Ant0-Hop-PASS

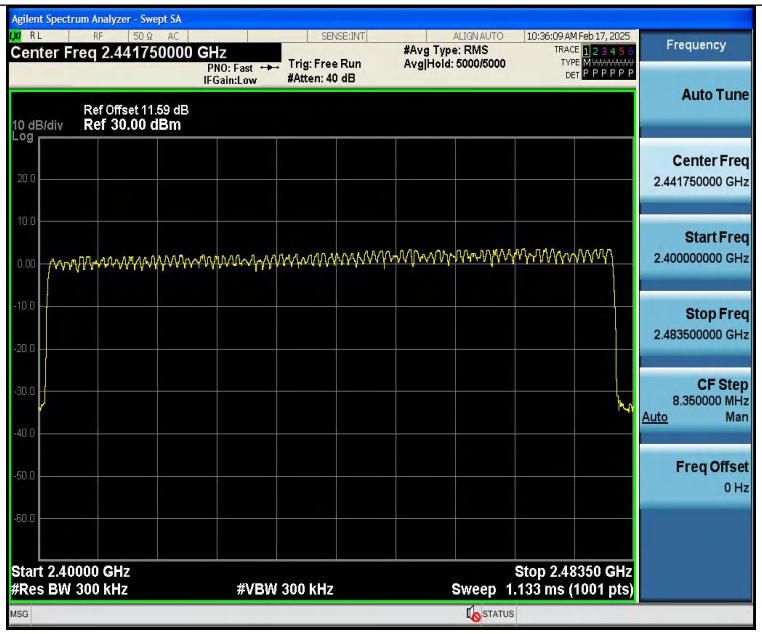


Ant2:

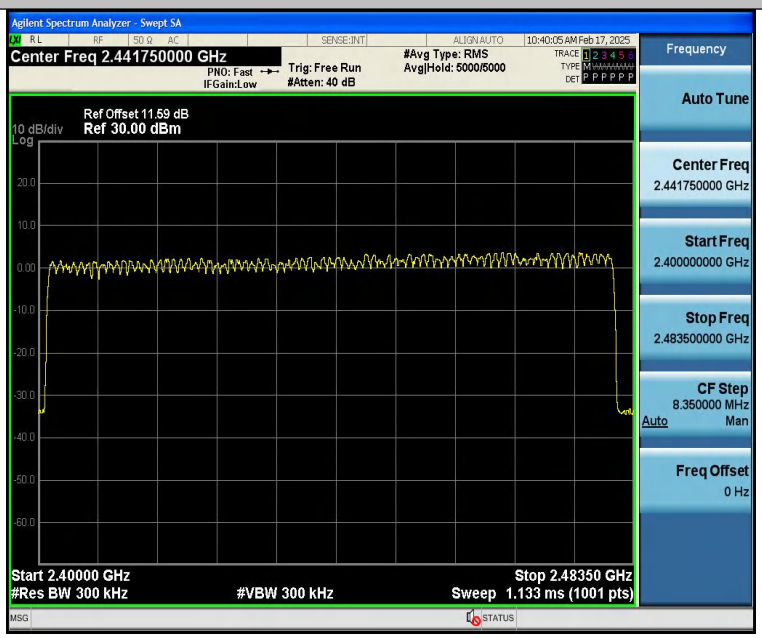
DH5-Ant2-Hop-PASS



2DH5-Ant2-Hop-PASS

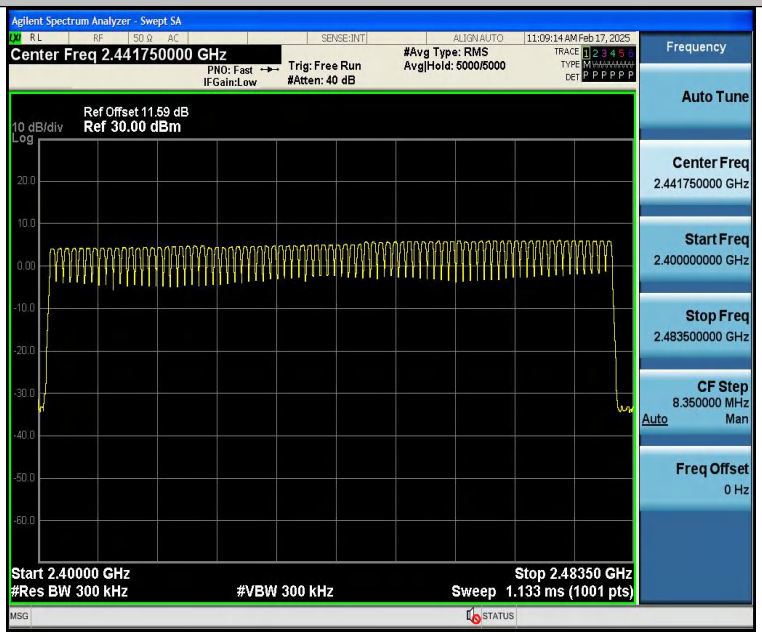


3DH5-Ant2-Hop-PASS

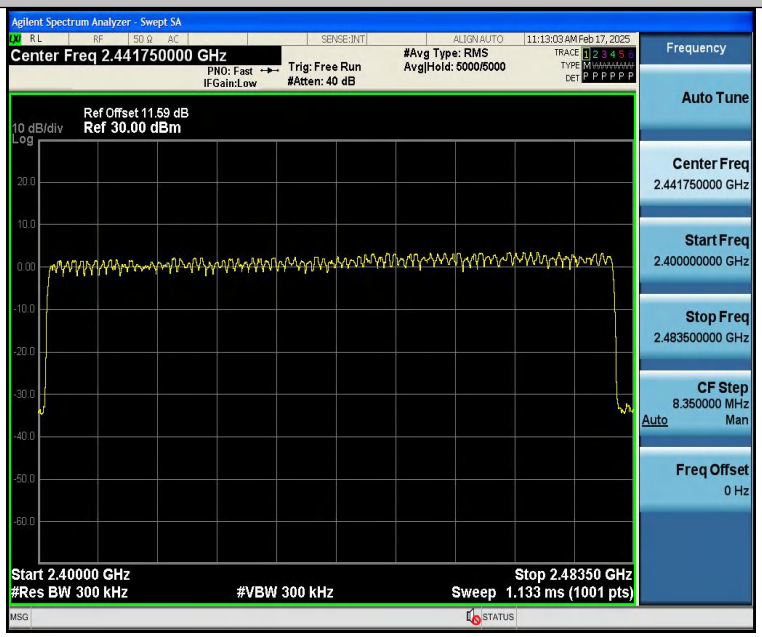


Ant4

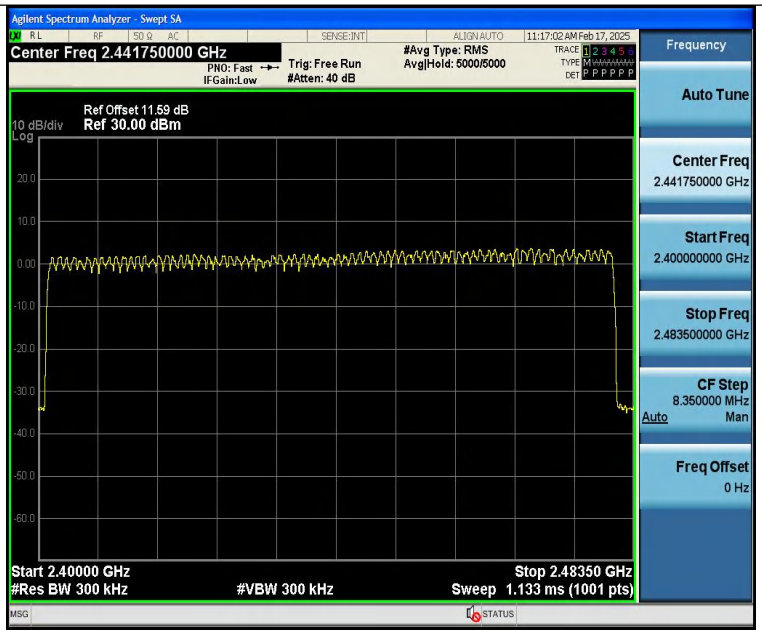
DH5-Ant4-Hop-PASS



2DH5-Ant4-Hop-PASS



3DH5-Ant4-Hop-PASS

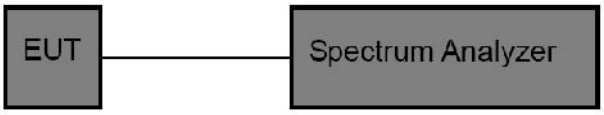

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.441750000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 5000/5000
11:17:02 AM Feb 17, 2025
Ref Offset 11.59 dB
10 dB/div
Ref 30.00 dBm
Log
Start 2.40000 GHz
#Res BW 300 kHz
#VBW 300 kHz
Stop 2.48350 GHz
Sweep 1.133 ms (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

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 = max hold.
7. Allow trace to fully stabilize.

12.4 Test Data

Test Item	:	Time of Occupancy	Test Mode	:	CH Low ~ CH High
Test Voltage	:	AC 120V	Temperature	:	24.5℃
Test Result	:	PASS	Humidity	:	55%RH

Ant0:

TestMode	Antenna	Frequency[MHz]	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH5	Ant0	Hop	2.885	106.67	0.308	≤0.4	PASS
2DH5	Ant0	Hop	2.891	106.67	0.308	≤0.4	PASS
3DH5	Ant0	Hop	2.892	106.67	0.308	≤0.4	PASS
DH1	Ant0	Hop	0.381	320	0.122	≤0.4	PASS
2DH1	Ant0	Hop	0.390	320	0.125	≤0.4	PASS
3DH1	Ant0	Hop	0.390	320	0.125	≤0.4	PASS
DH3	Ant0	Hop	1.637	160	0.262	≤0.4	PASS
2DH3	Ant0	Hop	1.642	160	0.263	≤0.4	PASS
3DH3	Ant0	Hop	1.642	160	0.263	≤0.4	PASS

Ant2:

TestMode	Antenna	Frequency[MHz]	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH5	Ant2	Hop	2.885	106.67	0.308	≤0.4	PASS
2DH5	Ant2	Hop	2.891	106.67	0.308	≤0.4	PASS
3DH5	Ant2	Hop	2.892	106.67	0.308	≤0.4	PASS
DH1	Ant2	Hop	0.381	320	0.122	≤0.4	PASS
2DH1	Ant2	Hop	0.390	320	0.125	≤0.4	PASS
3DH1	Ant2	Hop	0.390	320	0.125	≤0.4	PASS
DH3	Ant2	Hop	1.637	160	0.262	≤0.4	PASS
2DH3	Ant2	Hop	1.642	160	0.263	≤0.4	PASS
3DH3	Ant2	Hop	1.642	160	0.263	≤0.4	PASS

Ant4:

TestMode	Antenna	Frequency[MHz]	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH5	Ant4	Hop	2.885	106.67	0.308	≤0.4	PASS
2DH5	Ant4	Hop	2.891	106.67	0.308	≤0.4	PASS
3DH5	Ant4	Hop	2.892	106.67	0.308	≤0.4	PASS
DH1	Ant4	Hop	0.381	320	0.122	≤0.4	PASS
2DH1	Ant4	Hop	0.390	320	0.125	≤0.4	PASS
3DH1	Ant4	Hop	0.389	320	0.124	≤0.4	PASS
DH3	Ant4	Hop	1.637	160	0.262	≤0.4	PASS
2DH3	Ant4	Hop	1.643	160	0.263	≤0.4	PASS
3DH3	Ant4	Hop	1.640	160	0.262	≤0.4	PASS

Note:

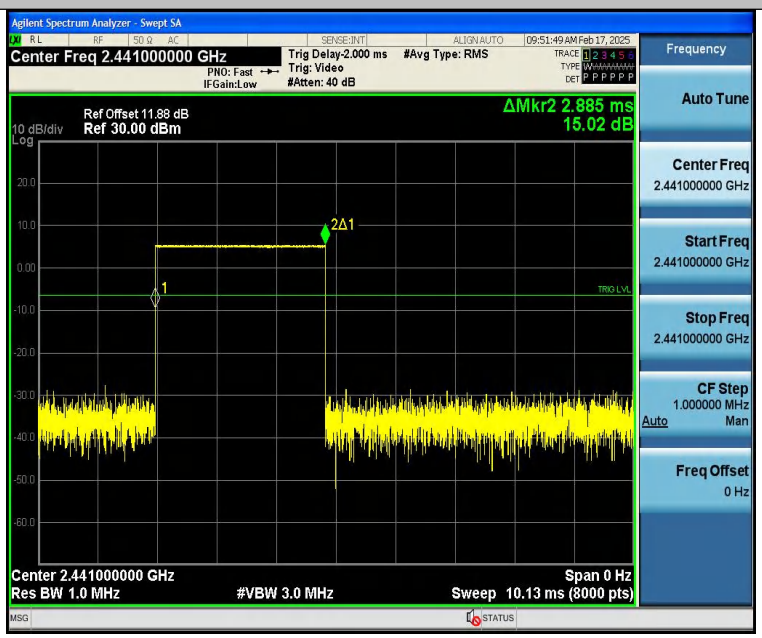
1.DH1/2DH1/3DH1 Dwell Time: Reading * (1600/2)*31.6/(channel number).

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

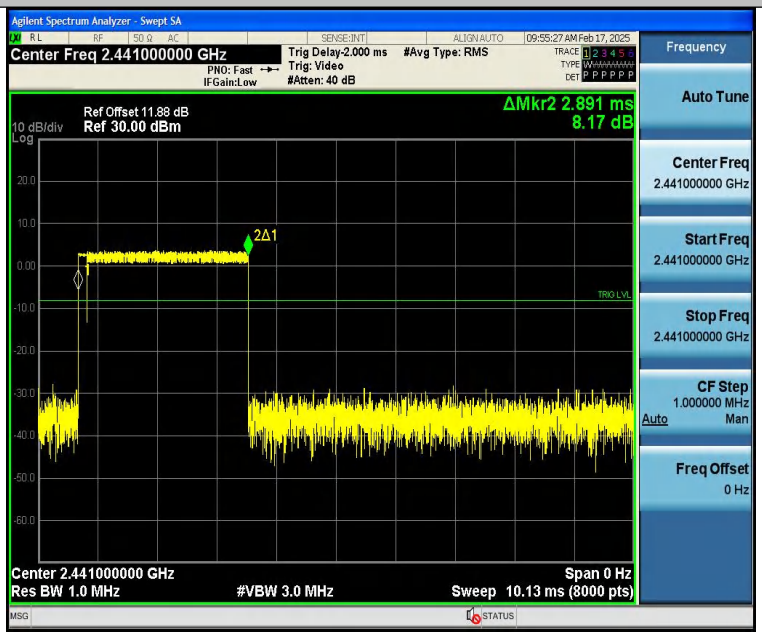
3.DH5/2DH5/3DH5 Dwell Time: Reading * (1600/6)*31.6/(channel number).

Ant0:

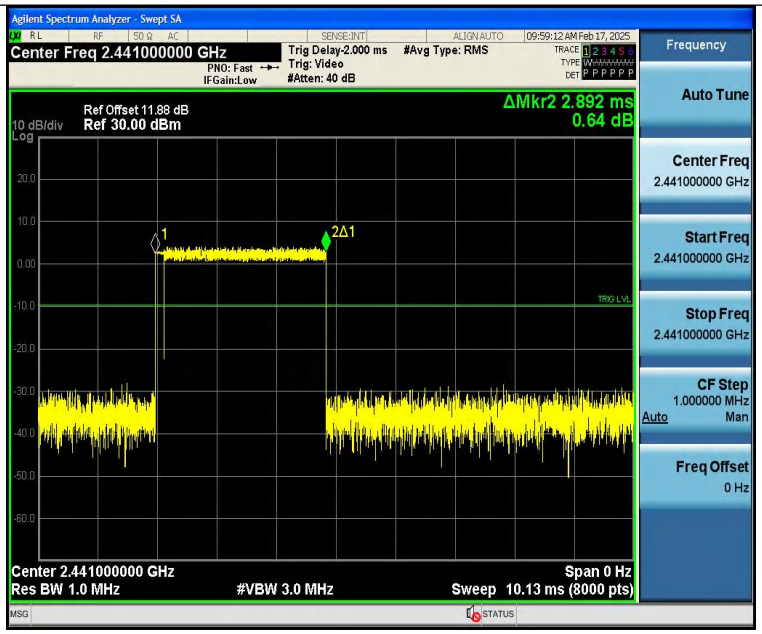
DH5-Ant0-Hop-PASS



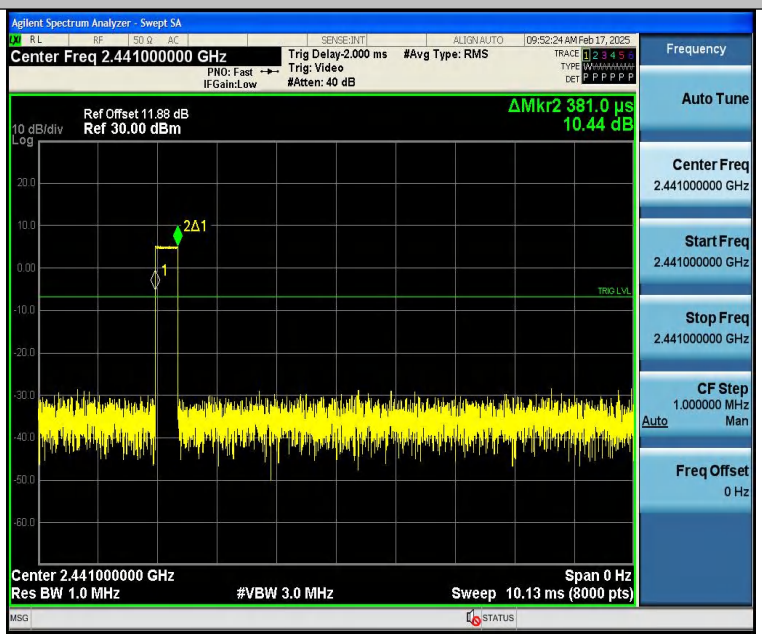
2DH5-Ant0-Hop-PASS



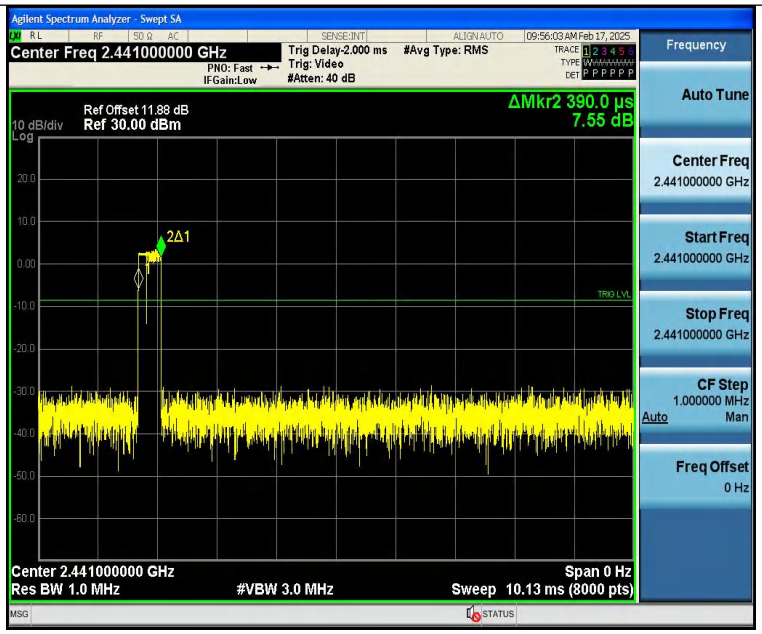
3DH5-Ant0-Hop-PASS



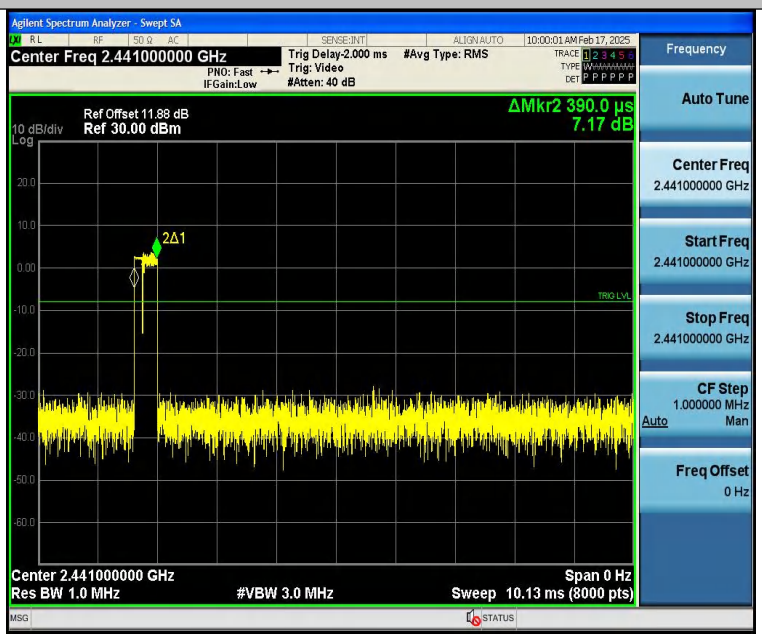
DH1-Ant0-Hop-PASS



2DH1-Ant0-Hop-PASS



3DH1-Ant0-Hop-PASS



DH3-Ant0-Hop-PASS