Appendix: Bluetooth Classic

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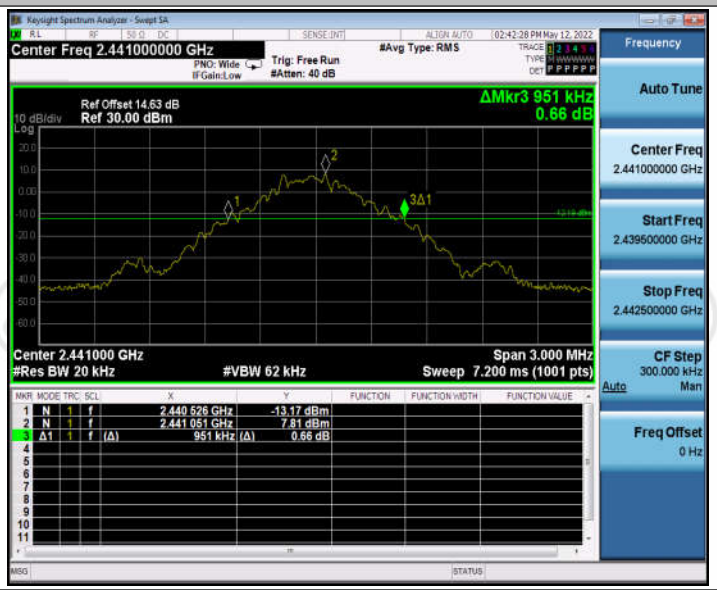
Appendix A: 20dB Emission Bandwidth

Test Result

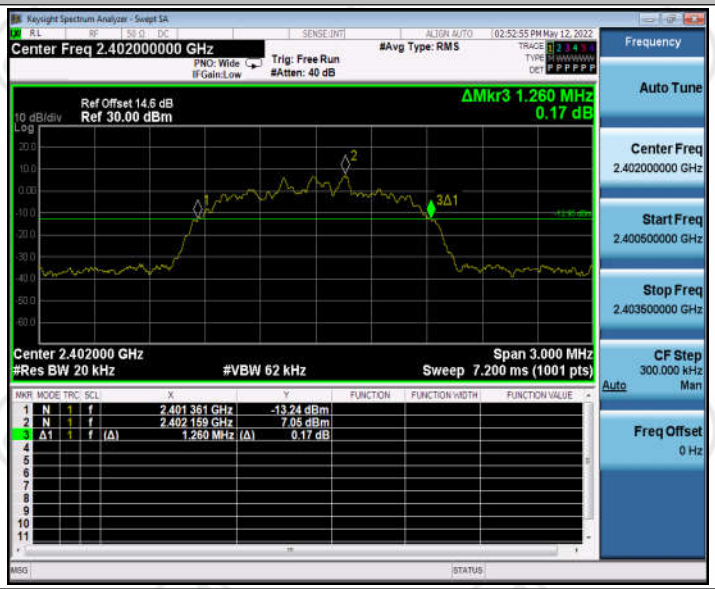
Test Mode	Antenna	Frequency[MHz]	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.948	2401.529	2402.477	---	---
		2441	0.951	2440.526	2441.477	---	---
		2480	0.948	2479.529	2480.477	---	---
2DH5	Ant1	2402	1.260	2401.361	2402.621	---	---
		2441	1.308	2440.334	2441.642	---	---
		2480	1.308	2479.334	2480.642	---	---
3DH5	Ant1	2402	1.254	2401.352	2402.606	---	---
		2441	1.260	2440.346	2441.606	---	---
		2480	1.263	2479.346	2480.609	---	---

Test Graphs

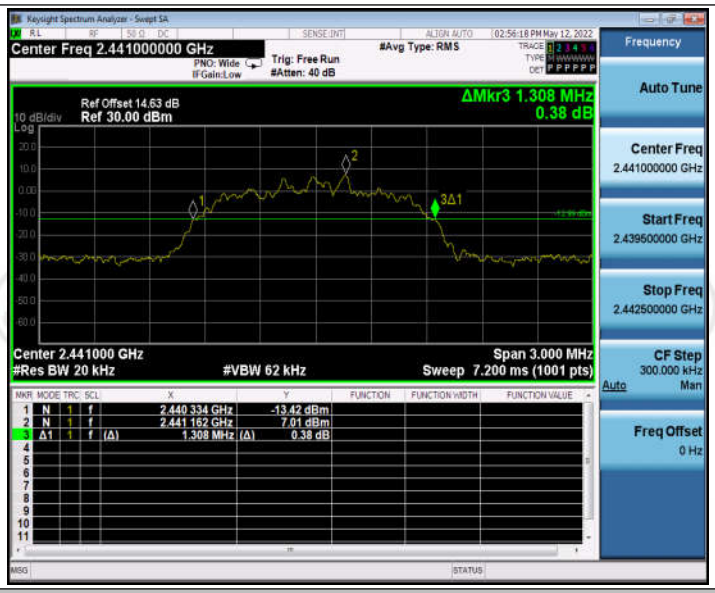
DH5_Ant1_2402

DH5_Ant1_2441

DH5_Ant1_2480

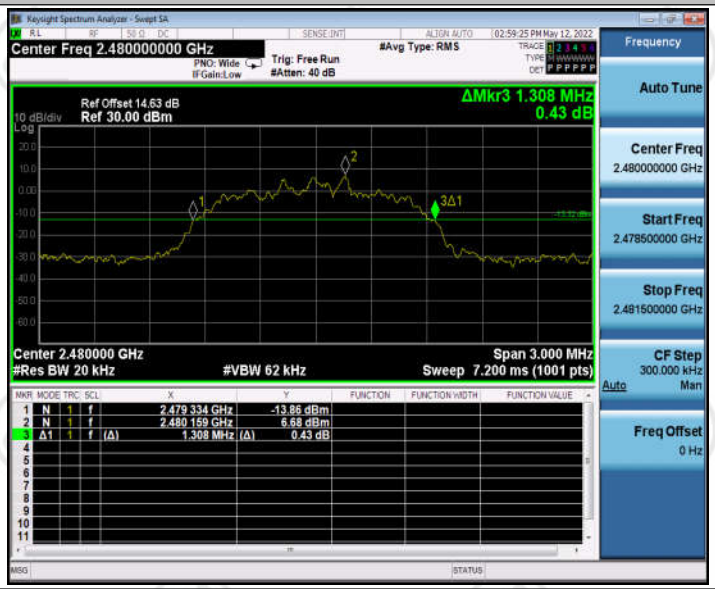
2DH5_Ant1_2402



2DH5_Ant1_2441

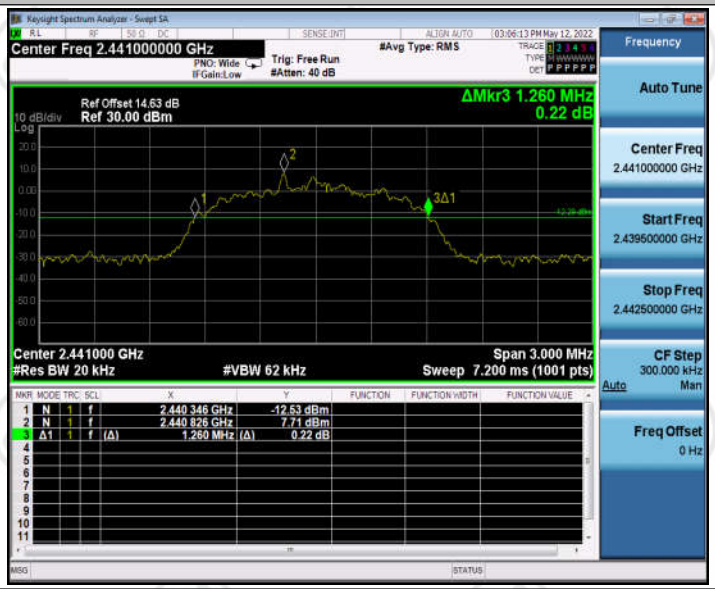


2DH5_Ant1_2480



3DH5_Ant1_2402

3DH5_Ant1_2441



3DH5_Ant1_2480


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
03:09:20 PM May 12, 2022
Frequency
Ref Offset 14.63 dB
10 dB/div
Ref 30.00 dBm
ΔMkr3 1.263 MHz
0.04 dB
Center 2.480000 GHz
#Res BW 20 kHz
#VBW 62 kHz
Span 3.000 MHz
Sweep 7.200 ms (1001 pts)
1 N 1 f 2.479 346 GHz -12.81 dBm
2 N 1 f 2.479 826 GHz 7.30 dBm
3 Δ1 1 f (Δ) 1.263 MHz (Δ) 0.04 dB
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

Appendix B: Occupied Channel Bandwidth

Test Result

Test Mode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.86192	2401.560	2402.422	---	---
		2441	0.86626	2440.557	2441.423	---	---
		2480	0.87050	2479.553	2480.423	---	---
2DH5	Ant1	2402	1.1581	2401.411	2402.569	---	---
		2441	1.1732	2440.404	2441.577	---	---
		2480	1.1745	2479.403	2480.577	---	---
3DH5	Ant1	2402	1.1520	2401.415	2402.567	---	---
		2441	1.1902	2440.390	2441.581	---	---
		2480	1.1900	2479.391	2480.581	---	---

Test Graphs

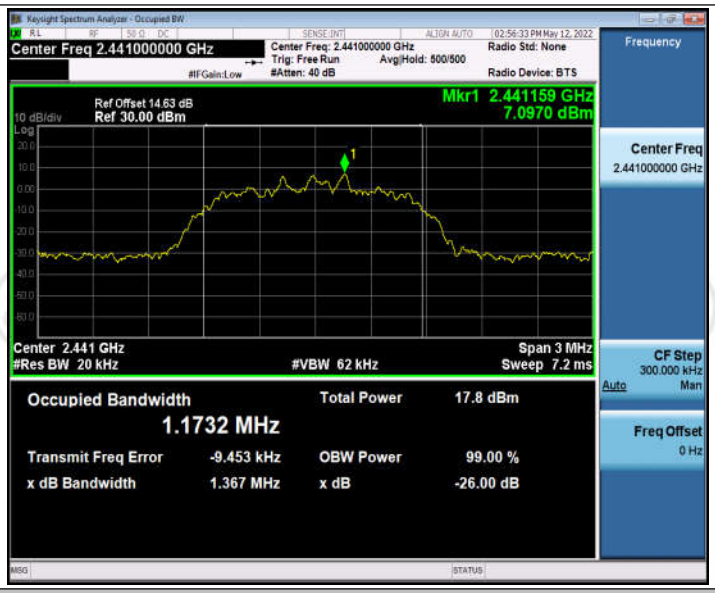
DH5_Ant1_2402

DH5_Ant1_2441

DH5_Ant1_2480

2DH5_Ant1_2402

2DH5_Ant1_2441



2DH5_Ant1_2480

3DH5_Ant1_2402

3DH5_Ant1_2441

3DH5_Ant1_2480

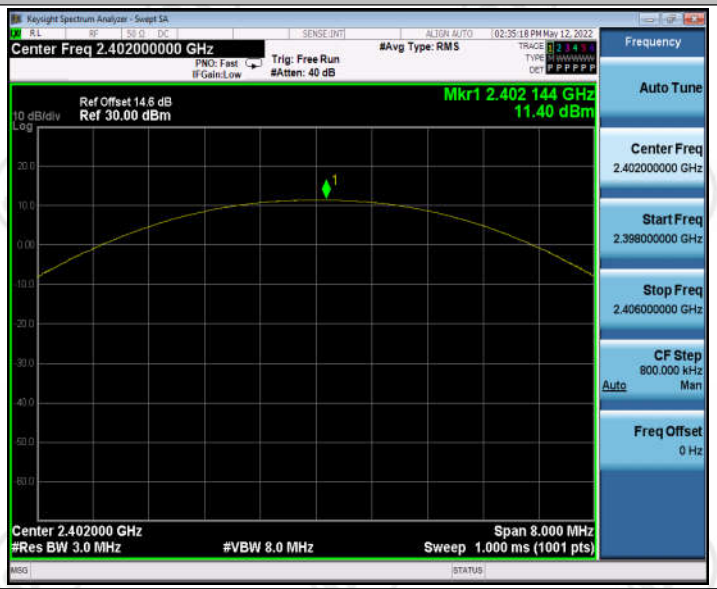
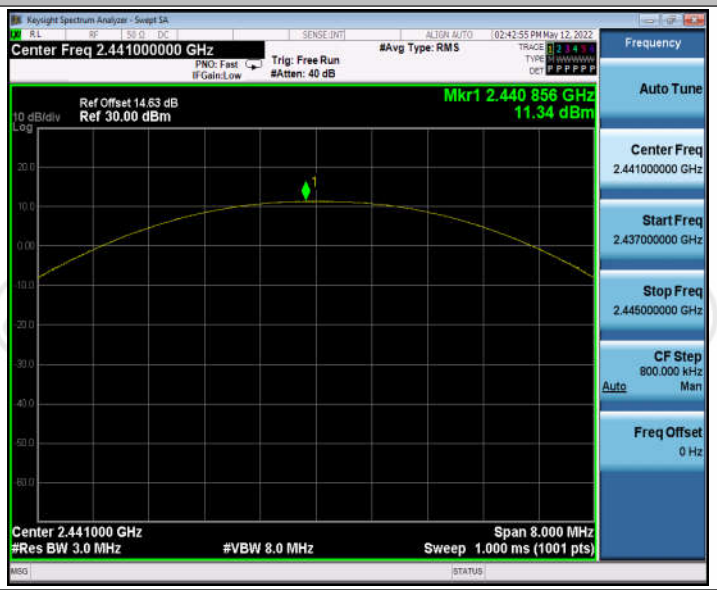

Keysight Spectrum Analyzer - Occupied BW
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold: 500/500
#Atten: 40 dB
Radio Std: None
Radio Device: BTS
Frequency
Ref Offset 14.63 dB
10 dB/div
Ref 30.00 dBm
Mkr1 2.479826 GHz
7.2686 dBm
Center Freq
2.480000000 GHz
Center 2.48 GHz
#Res BW 20 kHz
#VBW 62 kHz
Span 3 MHz
Sweep 7.2 ms
CF Step
300.000 kHz
Auto
Man
Occupied Bandwidth
1.1900 MHz
Total Power
17.2 dBm
Transmit Freq Error
-14.303 kHz
OBW Power
99.00 %
x dB Bandwidth
1.355 MHz
x dB
-26.00 dB
Freq Offset
0 Hz
MSG
STATUS

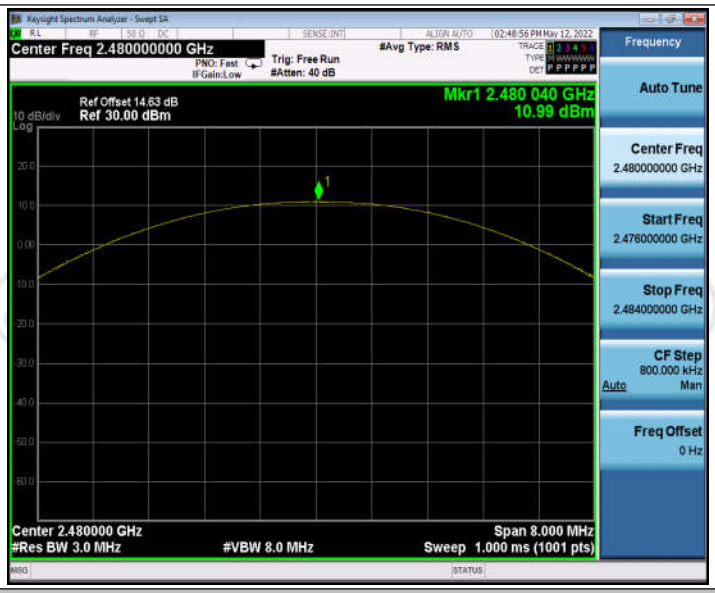
Appendix C: Maximum conducted output power

Test Result Peak

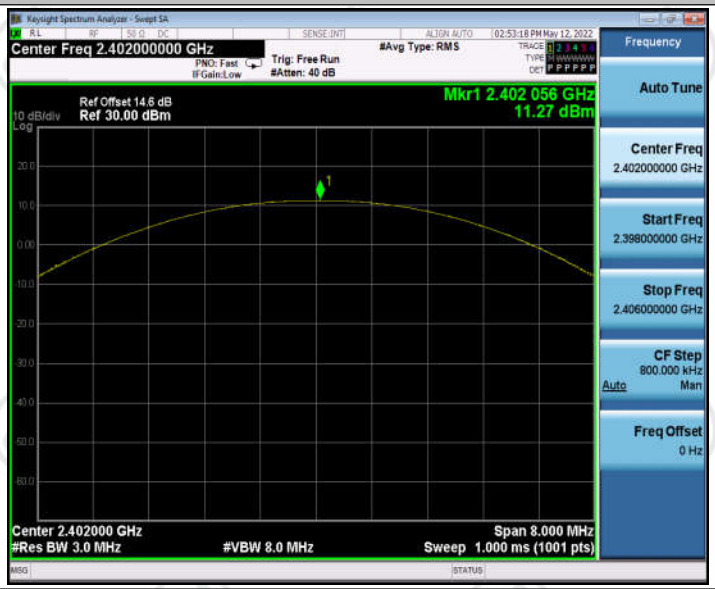
Test Mode	Antenna	Frequency[MHz]	Conducted Peak Powert[dBm]	Conducted Limit[dBm]	Verdict
DH5	Ant1	**2402**	**11.40**	≤20.97	PASS
		2441	11.34	≤20.97	PASS
		2480	10.99	≤20.97	PASS
2DH5	Ant1	2402	11.27	≤20.97	PASS
		2441	11.29	≤20.97	PASS
		2480	10.98	≤20.97	PASS
3DH5	Ant1	2402	9.23	≤20.97	PASS
		2441	**11.40**	≤20.97	PASS
		2480	11.06	≤20.97	PASS

Test Graphs

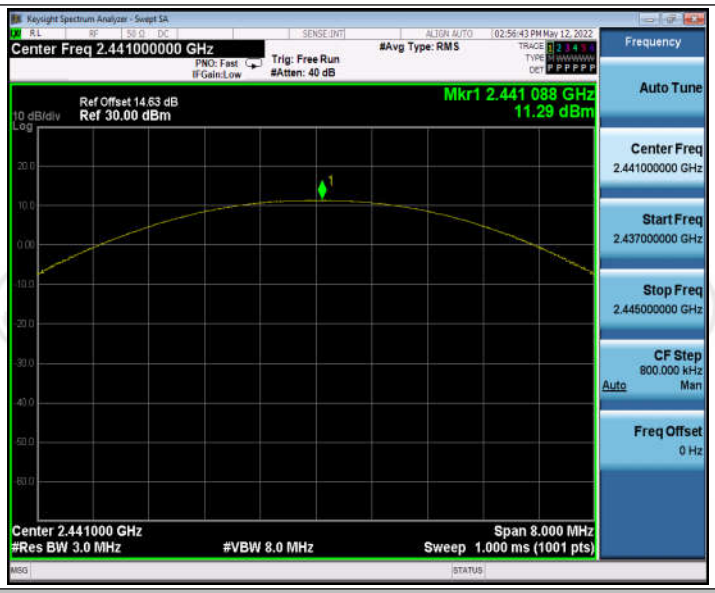
DH5_Ant1_2402

DH5_Ant1_2441

DH5_Ant1_2480



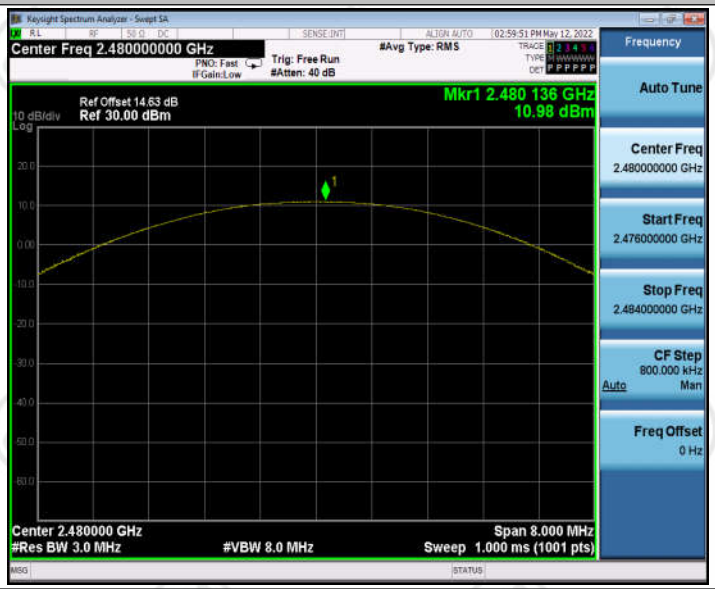
2DH5_Ant1_2402



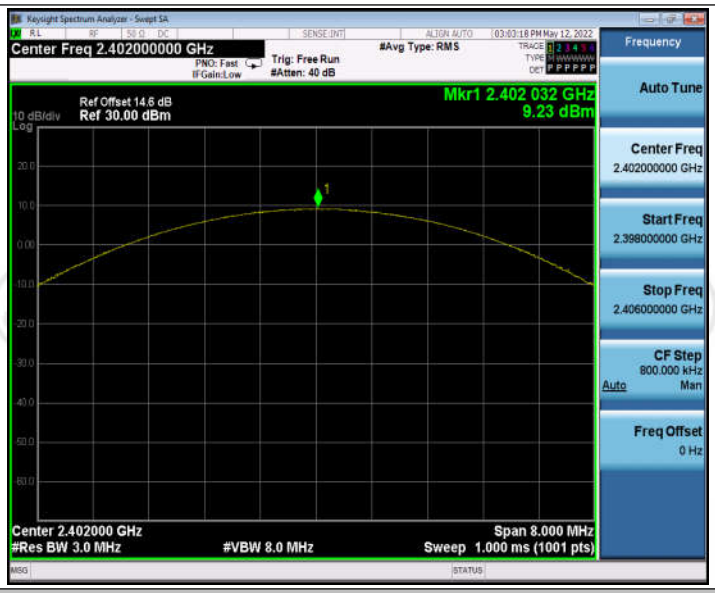
2DH5_Ant1_2441



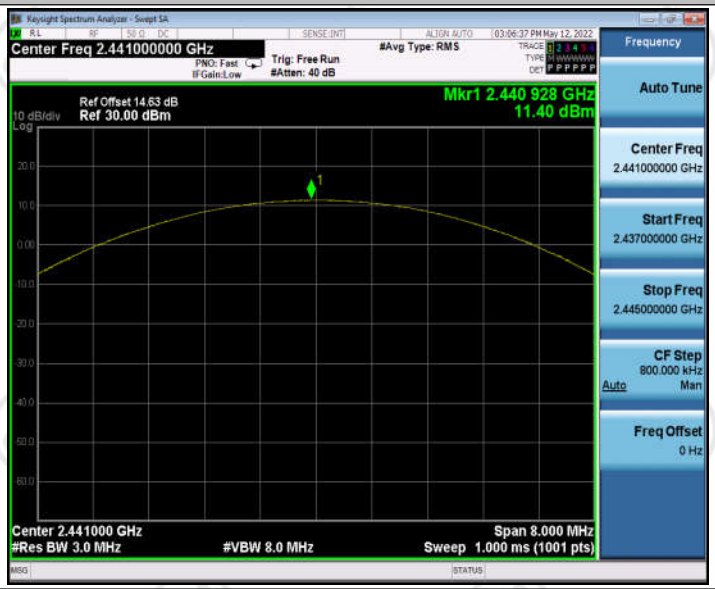
2DH5_Ant1_2480



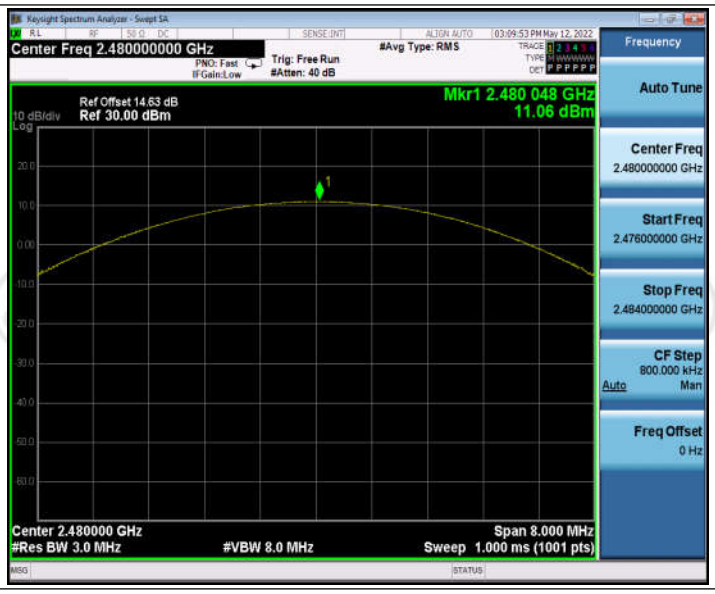
3DH5_Ant1_2402



3DH5_Ant1_2441



3DH5_Ant1_2480


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
03:09:53 PM May 12, 2022
Frequency
Ref Offset 14.63 dB
10 dB/div
Log
Ref 30.00 dBm
Mkr1 2.480 048 GHz
11.06 dBm
Auto Tune
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)
MSG
STATUS

Appendix D: Carrier frequency separation

Test Result

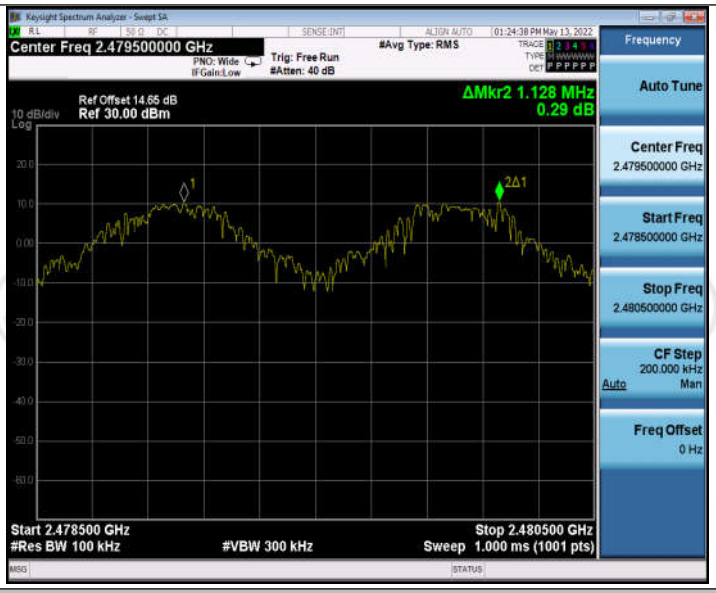
Test Mode	Antenna	Frequency[MHz]	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant1	Hop_2402	0.92	≥0.634	PASS
		Hop_2441	0.978	≥0.951	PASS
		Hop_2480	1.128	≥0.951	PASS
2DH5	Ant1	Hop_2402	0.962	≥0.872	PASS
		Hop_2441	0.932	≥0.872	PASS
		Hop_2480	1.004	≥0.872	PASS
3DH5	Ant1	Hop_2402	0.986	≥0.842	PASS
		Hop_2441	0.916	≥0.842	PASS
		Hop_2480	1.02	≥0.842	PASS

Test Graphs

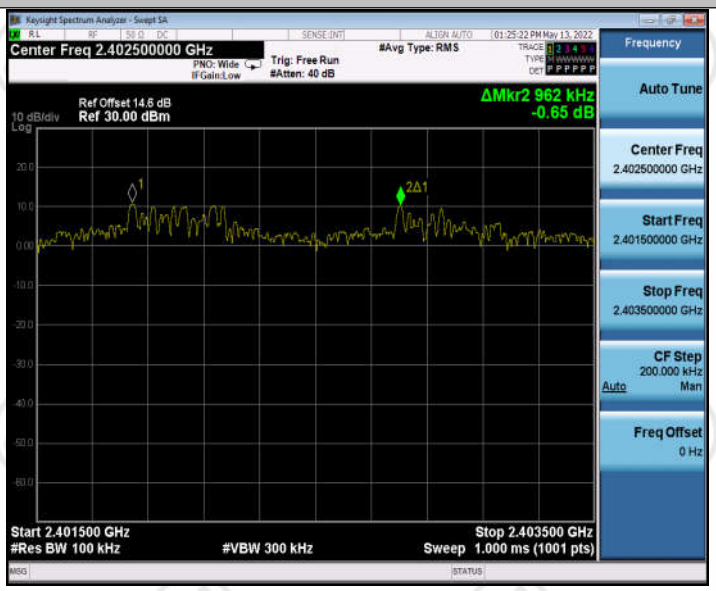
DH5_Ant1_Hop_2402

DH5_Ant1_Hop_2441

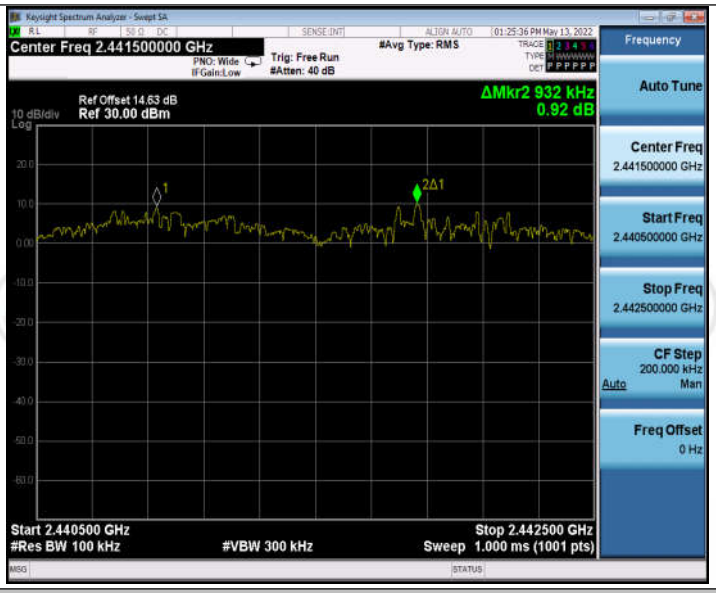
DH5_Ant1_Hop_2480



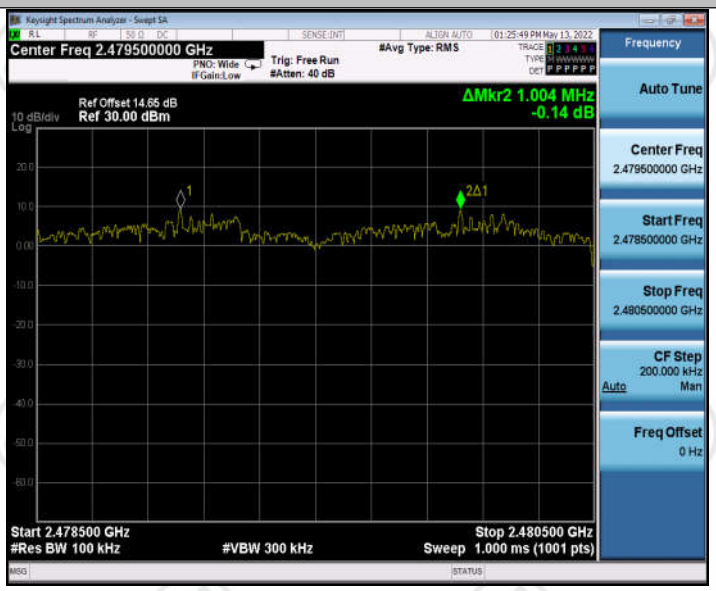
2DH5_Ant1_Hop_2402



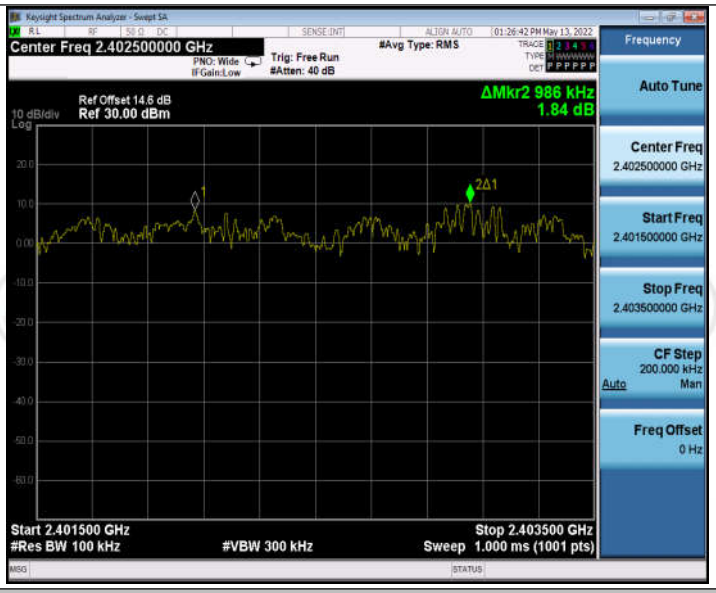
2DH5_Ant1_Hop_2441



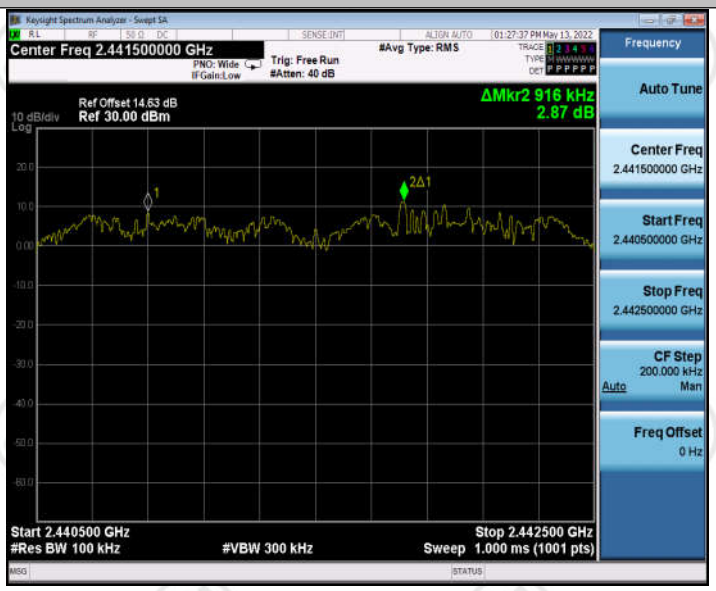
2DH5_Ant1_Hop_2480



3DH5_Ant1_Hop_2402



3DH5_Ant1_Hop_2441



3DH5_Ant1_Hop_2480


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.479500000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
01:28:49 PM May 13, 2022
Ref Offset 14.65 dB
10 dB/div
Log
Ref 30.00 dBm
ΔMkr2 1.020 MHz
-0.25 dB
1
2Δ1
Start 2.478500 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.480500 GHz
Sweep 1.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.479600000 GHz
Start Freq
2.478600000 GHz
Stop Freq
2.480600000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

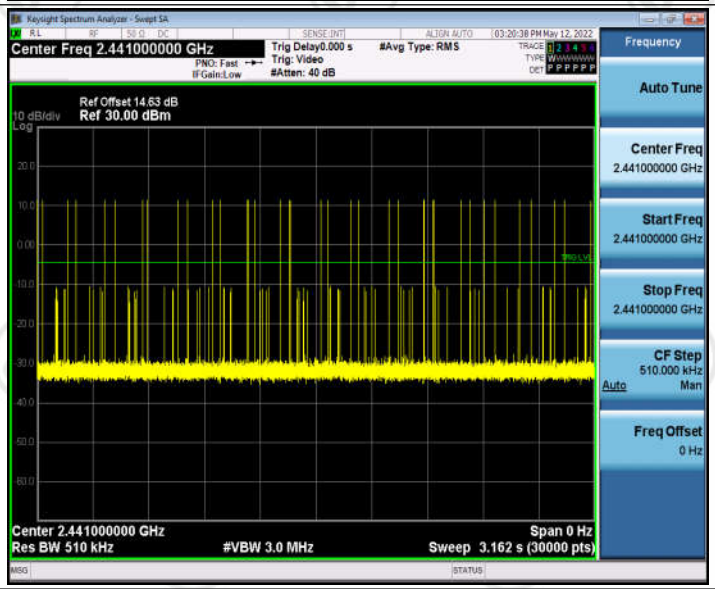
Appendix E: Time of occupancy

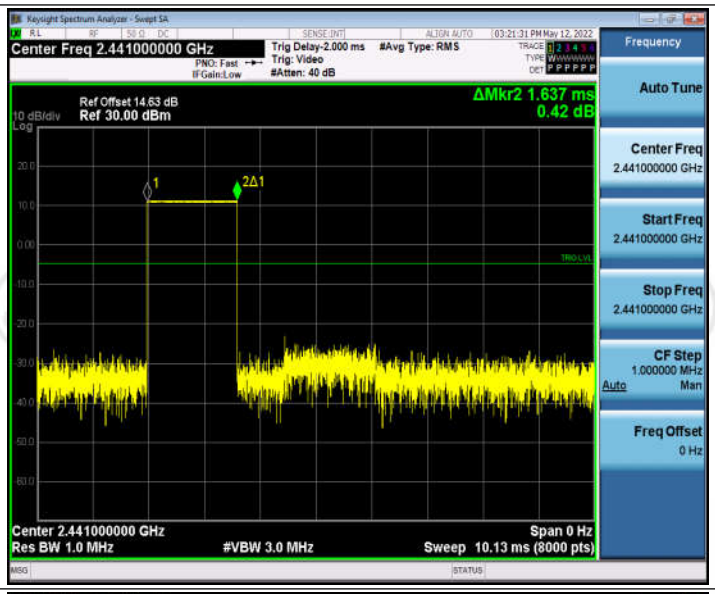
Test Result

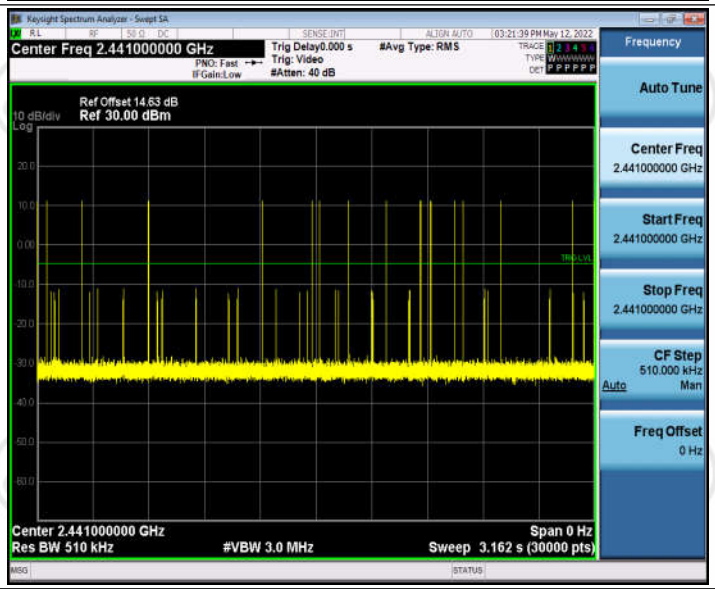
Test Mode	Antenna	Frequency[MHz]	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.38	330	0.126	≤0.4	PASS
DH3	Ant1	Hop	1.64	160	0.262	≤0.4	PASS
DH5	Ant1	Hop	2.89	120	0.346	≤0.4	PASS
2DH1	Ant1	Hop	0.39	320	0.125	≤0.4	PASS
2DH3	Ant1	Hop	1.64	160	0.263	≤0.4	PASS
2DH5	Ant1	Hop	2.89	50	0.145	≤0.4	PASS
3DH1	Ant1	Hop	0.39	330	0.129	≤0.4	PASS
3DH3	Ant1	Hop	1.64	210	0.345	≤0.4	PASS
3DH5	Ant1	Hop	2.89	110	0.318	≤0.4	PASS

Test Graphs

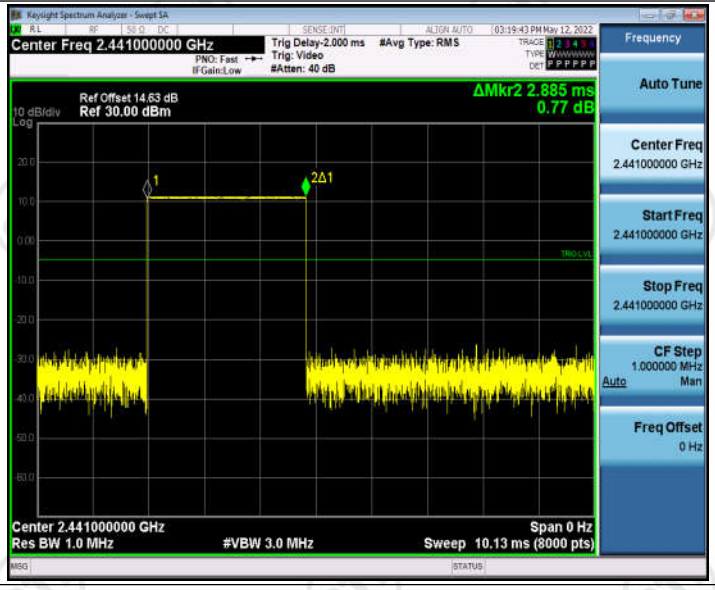
DH1_Ant1_Hop

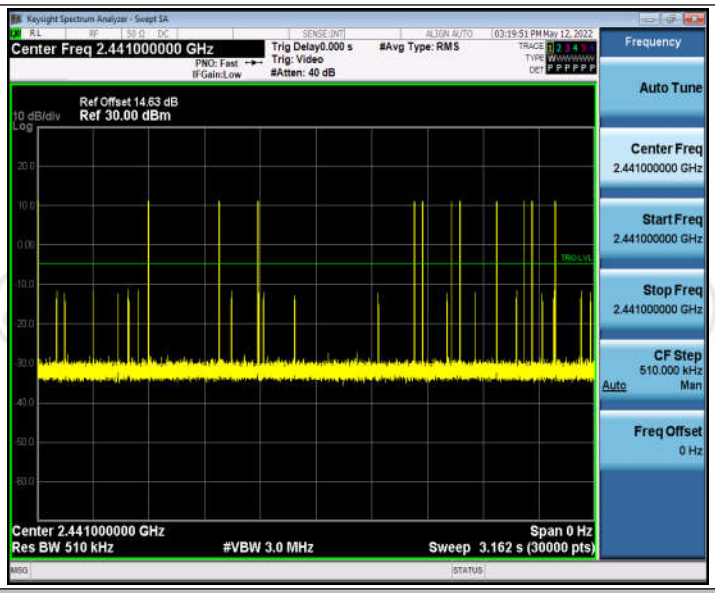

DH3_Ant1_Hop


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.441000000 GHz
PNO: Fast
IFGain:Low
Trig Delay-2.000 ms
Trig: Video
#Avg Type: RMS
#Atten: 40 dB
03:21:31 PM May 12, 2022
Ref Offset 14.63 dB
10 dB/div
Ref 30.00 dBm
ΔMkr2 1.637 ms
0.42 dB
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

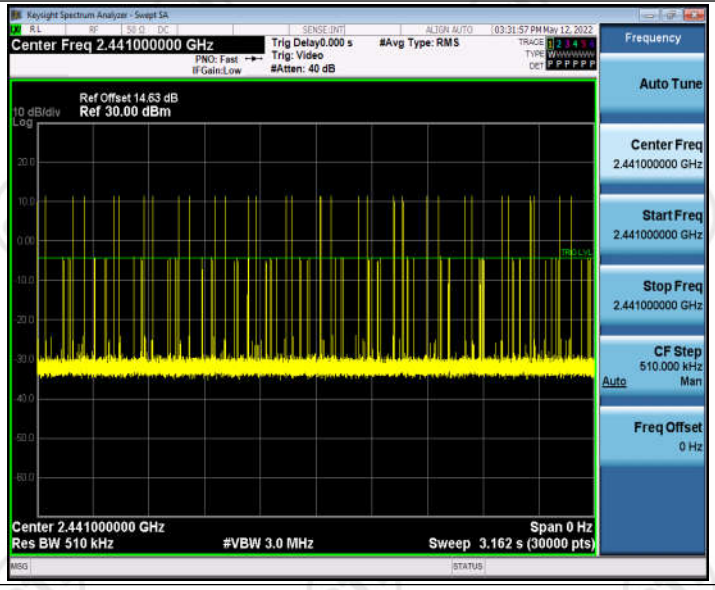

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.441000000 GHz
PNO: Fast
IFGain:Low
Trig Delay0.000 s
Trig: Video
#Avg Type: RMS
#Atten: 40 dB
03:21:39 PM May 12, 2022
Ref Offset 14.63 dB
10 dB/div
Ref 30.00 dBm
Center 2.441000000 GHz
Res BW 510 kHz
#VBW 3.0 MHz
Span 0 Hz
Sweep 3.162 s (30000 pts)
Frequency
Auto Tune
Center Freq
2.441000000 GHz
Start Freq
2.441000000 GHz
Stop Freq
2.441000000 GHz
CF Step
510.000 kHz
Auto
Man
Freq Offset
0 Hz

DH5_Ant1_Hop

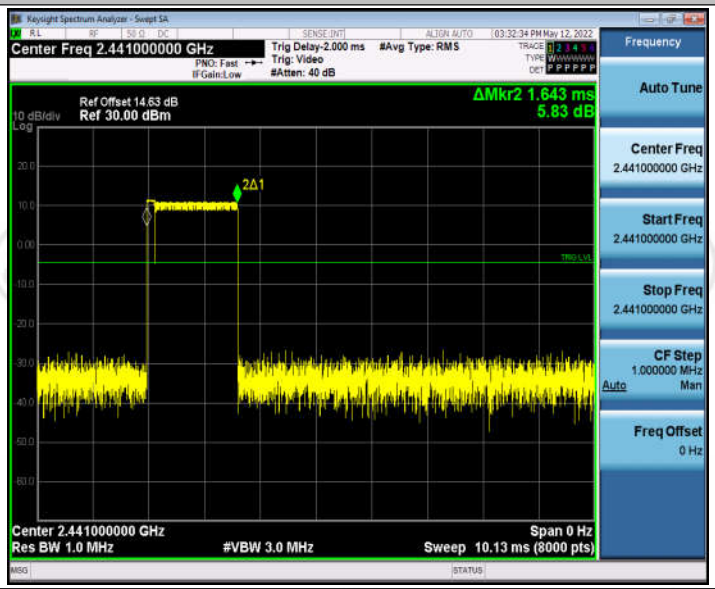

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.441000000 GHz
PNO: Fast
IFGain:Low
Trig Delay-2.000 ms
Trig: Video
#Avg Type: RMS
#Atten: 40 dB
03:19:43 PM May 12, 2022
Ref Offset 14.63 dB
10 dB/div
Ref 30.00 dBm
ΔMkr2 2.885 ms
0.77 dB
Center 2.441000000 GHz
Res BW 1.0 MHz
#VBW 3.0 MHz
Span 0 Hz
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

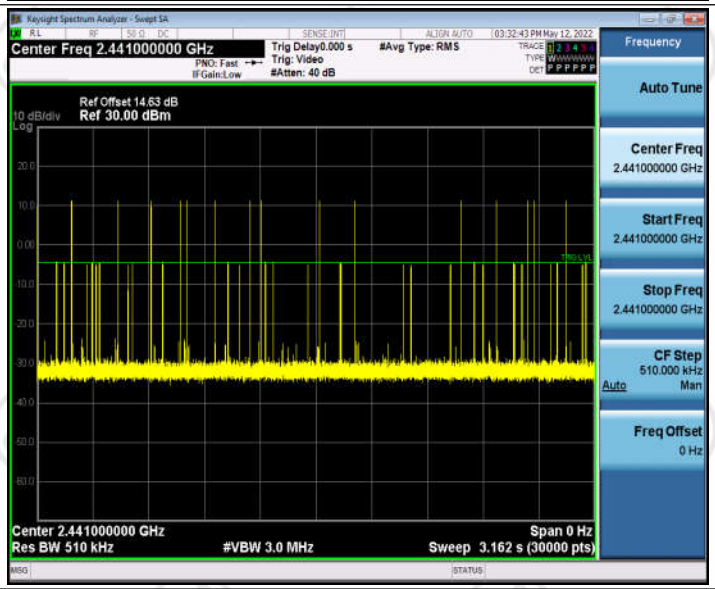


2DH1_Ant1_Hop

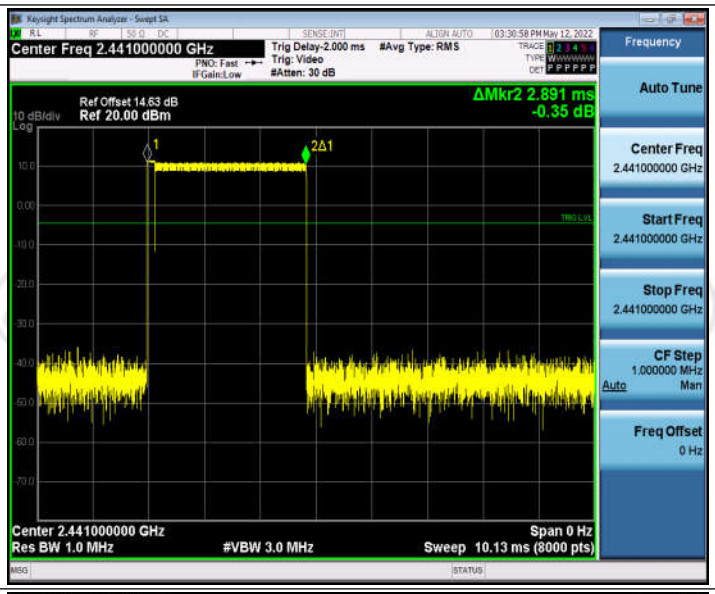


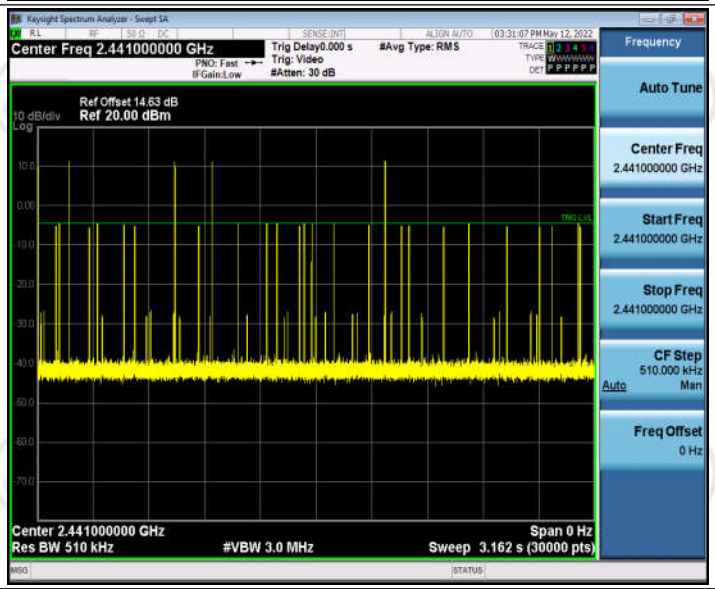
2DH3_Ant1_Hop



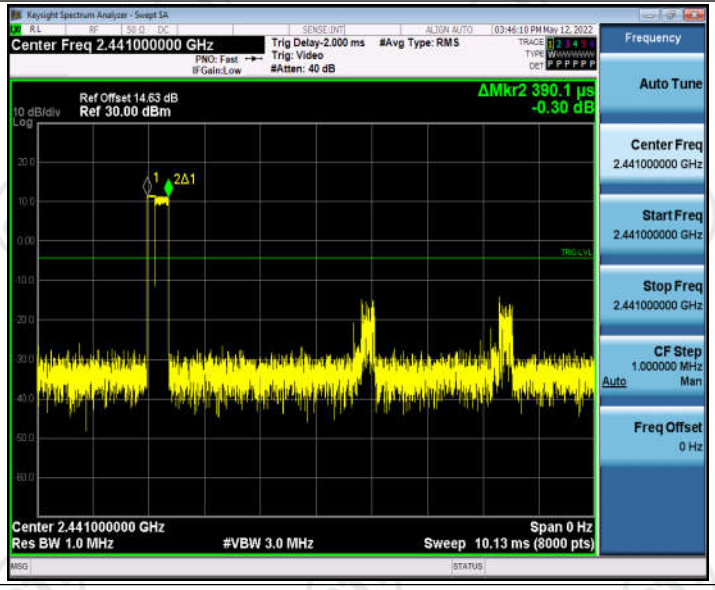


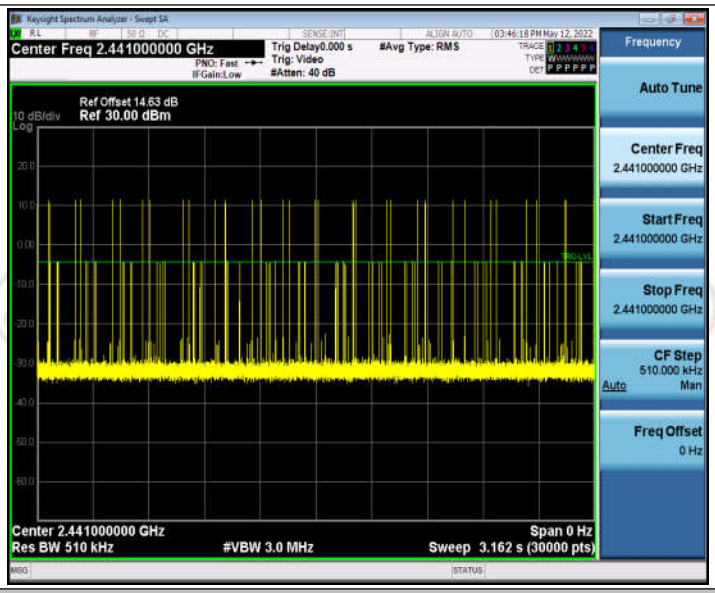
2DH5_Ant1_Hop



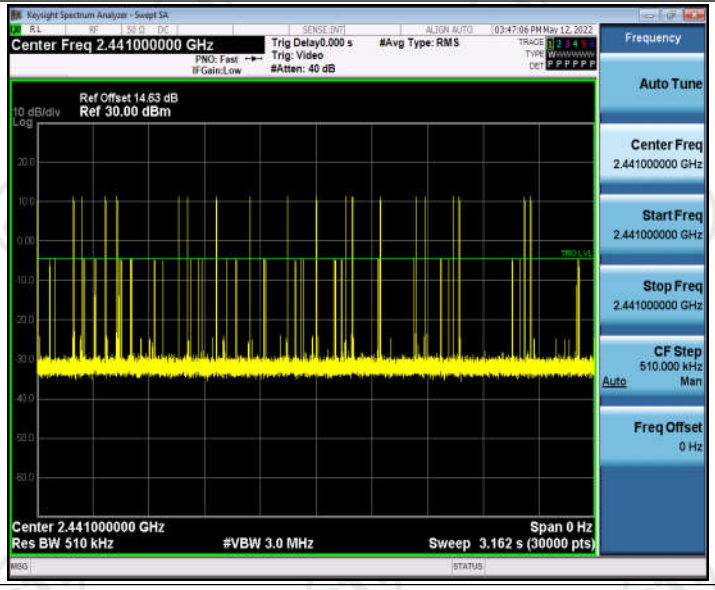


3DH1_Ant1_Hop

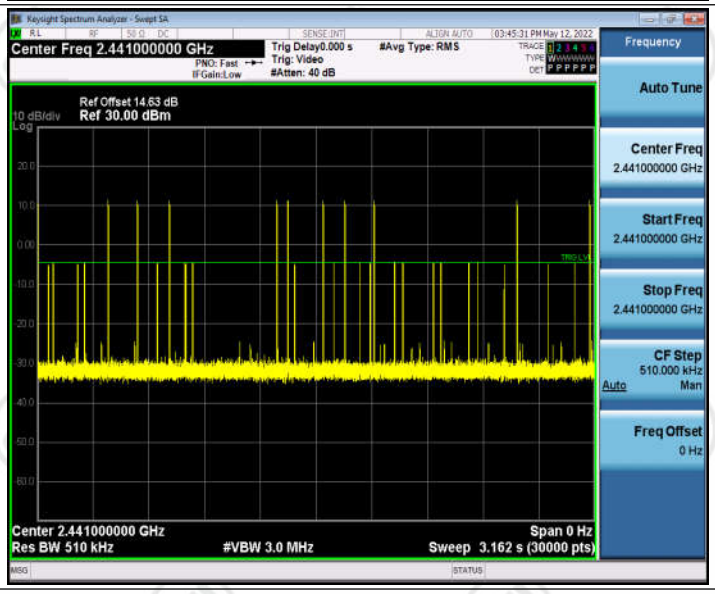




3DH3_Ant1_Hop



3DH5_Ant1_Hop

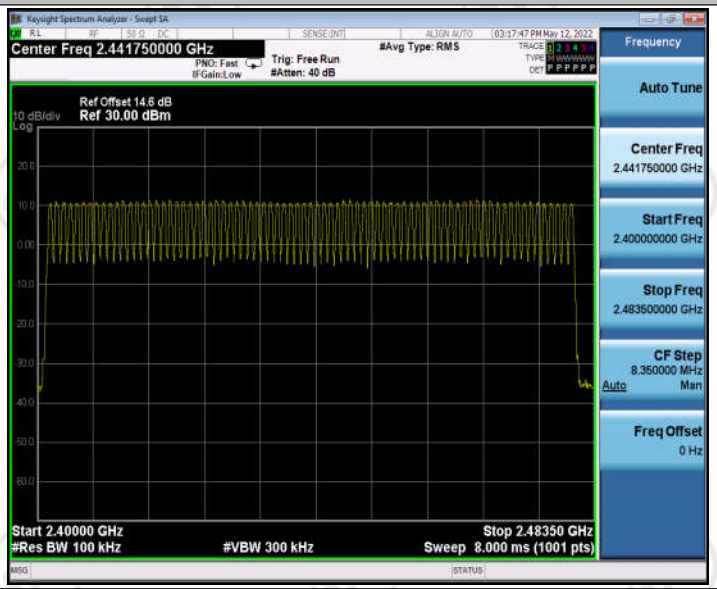
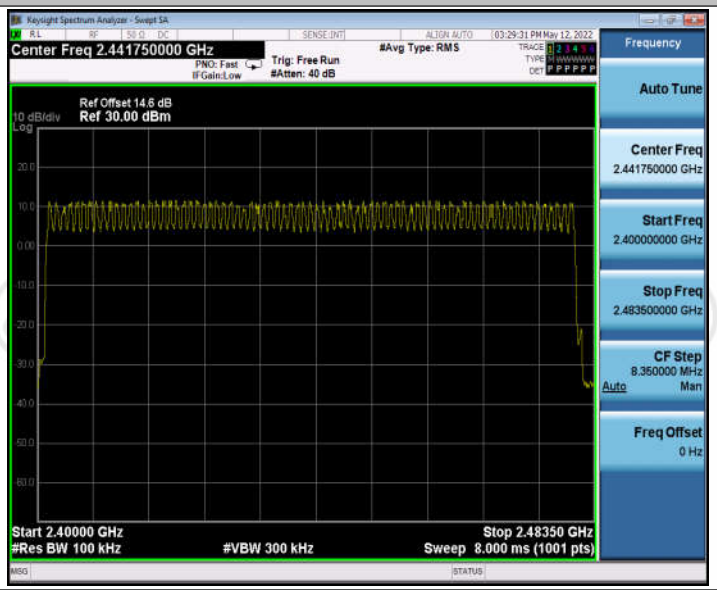


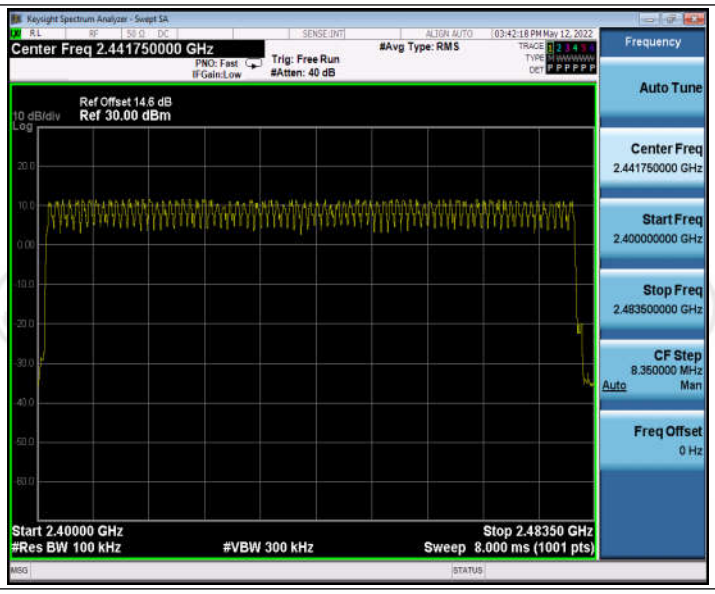
Appendix F: Number of hopping channels

Test Result

Test Mode	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

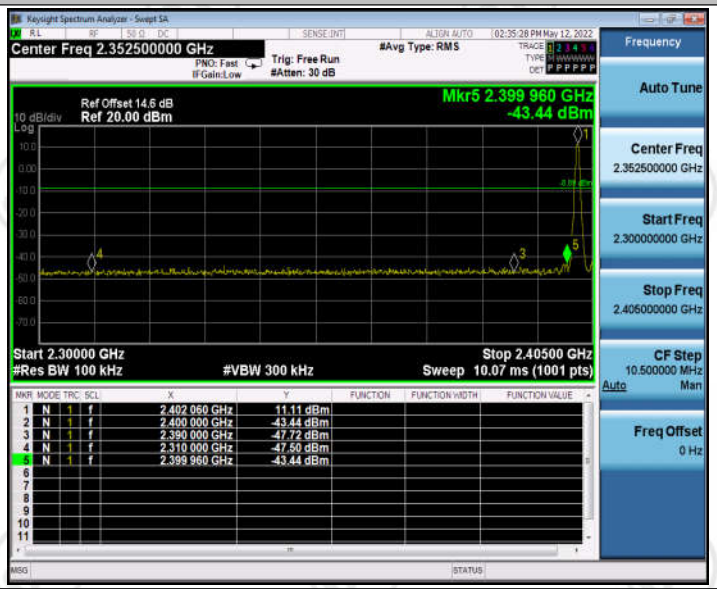
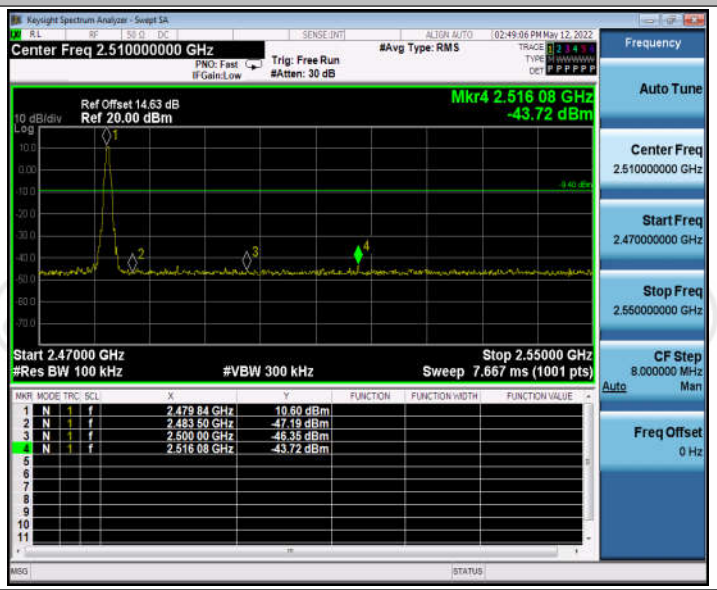

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.441750000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
03:42:18 PM May 12, 2022
Ref Offset 14.6 dB
10 dB/div
Log
Ref 30.00 dBm
Start 2.40000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.48350 GHz
Sweep 8.000 ms (1001 pts)
Frequency
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
MSG
STATUS

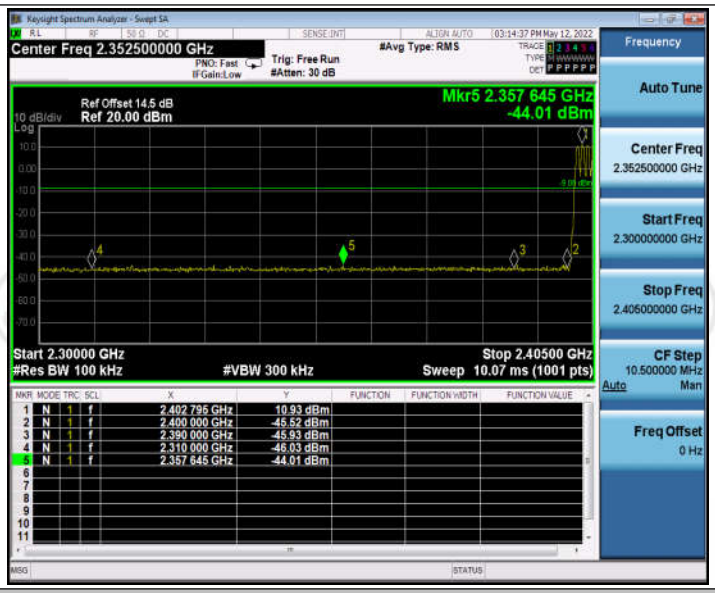
Appendix G: Band edge measurements

Test Result

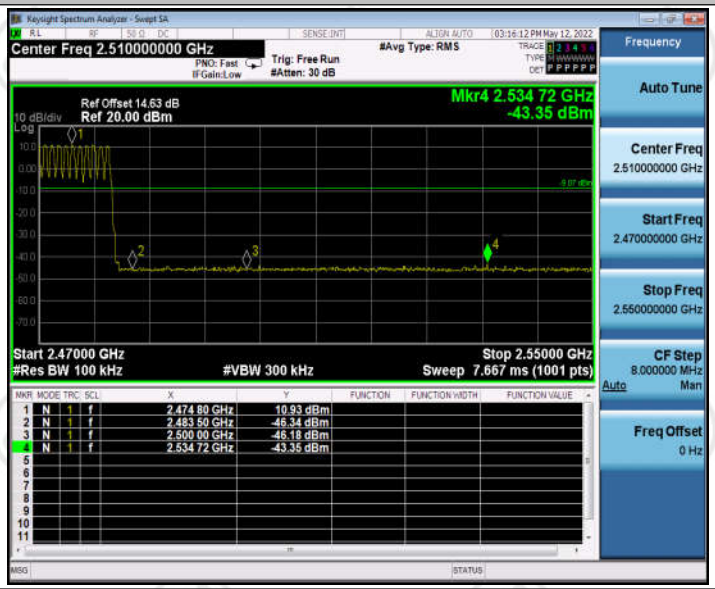
Test Mode	Antenna	ChName	Frequency[MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Low	2402	11.11	-43.45	≤-8.89	PASS
		High	2480	10.60	-43.72	≤-9.4	PASS
		Low	Hop_2402	10.93	-44.01	≤-9.08	PASS
		High	Hop_2480	10.93	-43.35	≤-9.07	PASS
2DH5	Ant1	Low	2402	11.08	-41.44	≤-8.92	PASS
		High	2480	10.64	-43.77	≤-9.36	PASS
		Low	Hop_2402	11.00	-44.23	≤-9	PASS
		High	Hop_2480	10.63	-42.54	≤-9.37	PASS
3DH5	Ant1	Low	2402	8.25	-44.61	≤-11.75	PASS
		High	2480	10.45	-44.27	≤-9.55	PASS
		Low	Hop_2402	11.12	-44.35	≤-8.88	PASS
		High	Hop_2480	11.23	-43.7	≤-8.77	PASS

Test Graphs

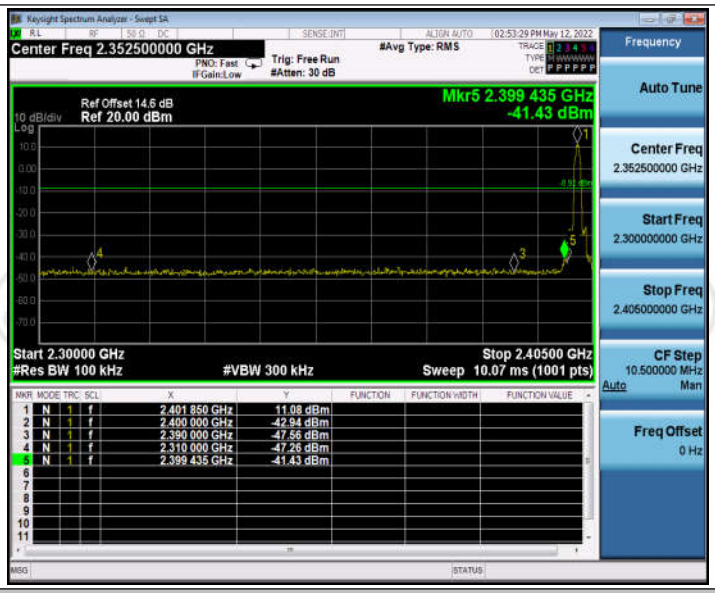
DH5_Ant1_Low_2402

DH5_Ant1_High_2480

DH5_Ant1_Low_Hop_2402



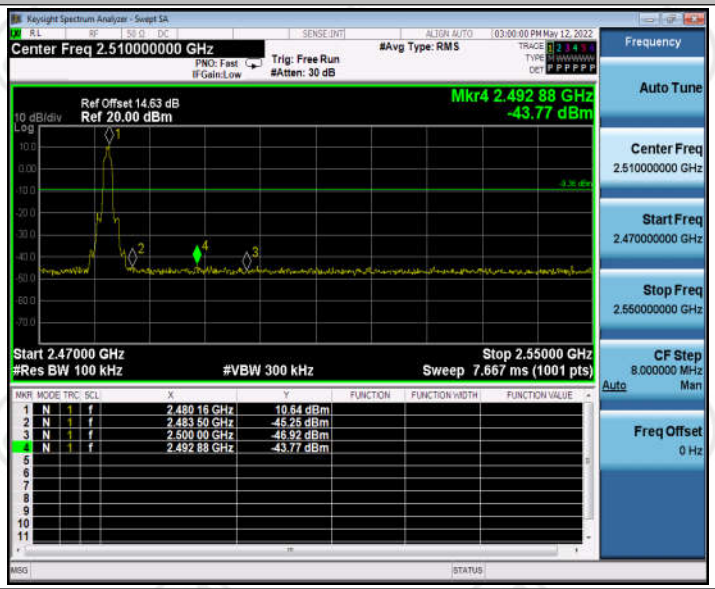
DH5_Ant1_High_Hop_2480



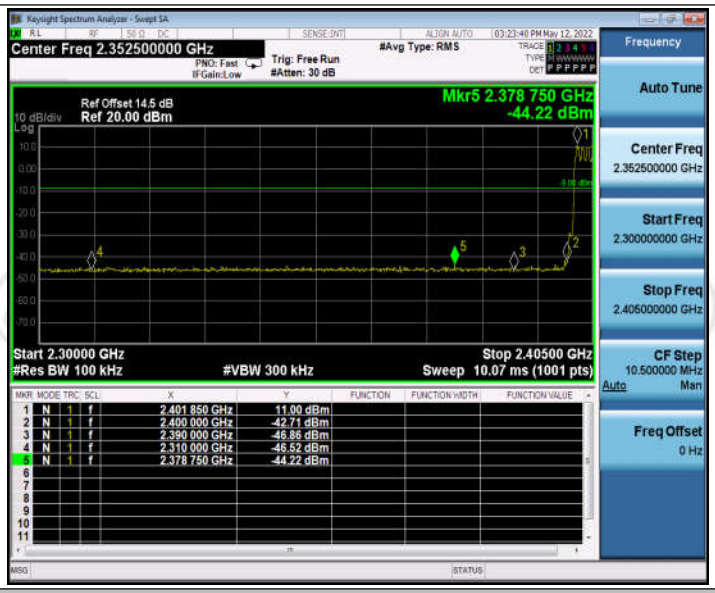
2DH5_Ant1_Low_2402



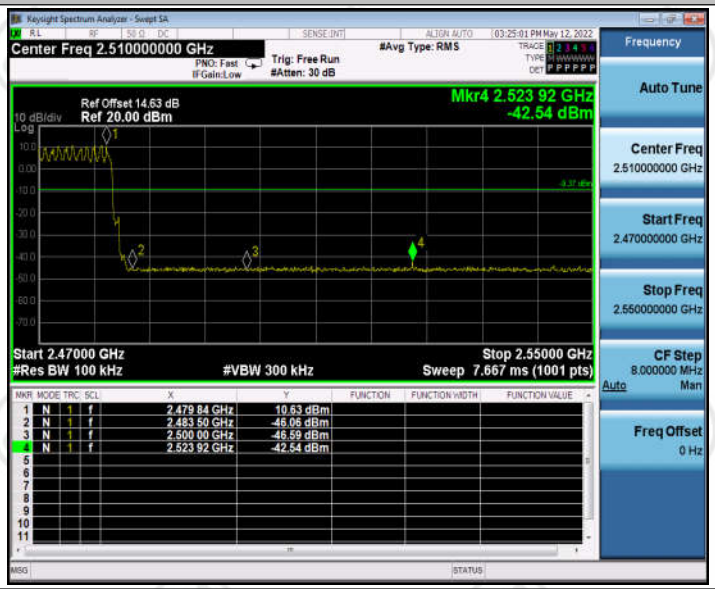
2DH5_Ant1_High_2480



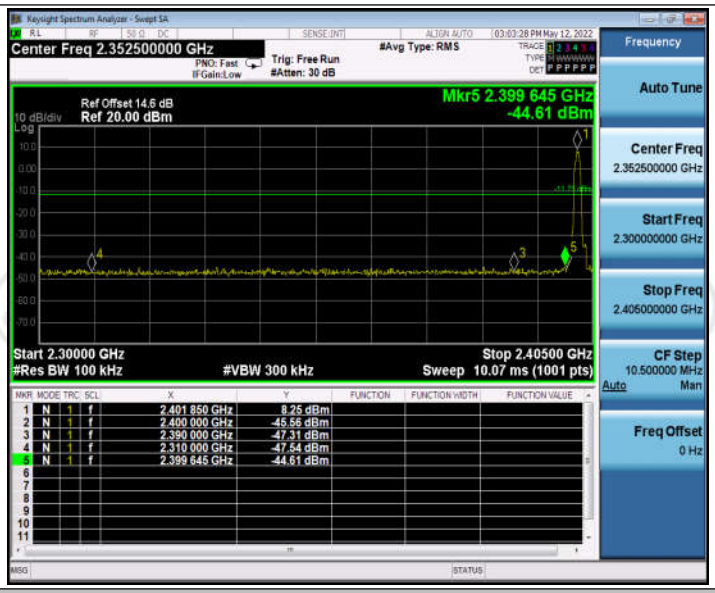
2DH5_Ant1_Low_Hop_2402



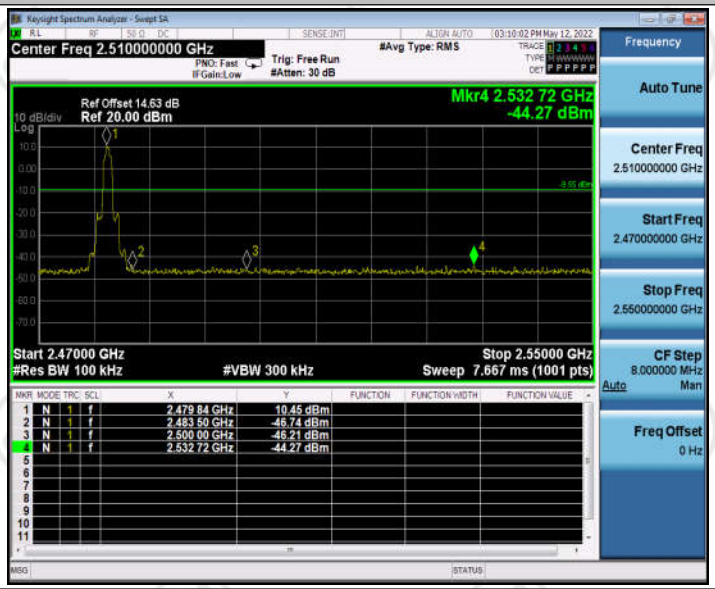
2DH5_Ant1_High_Hop_2480



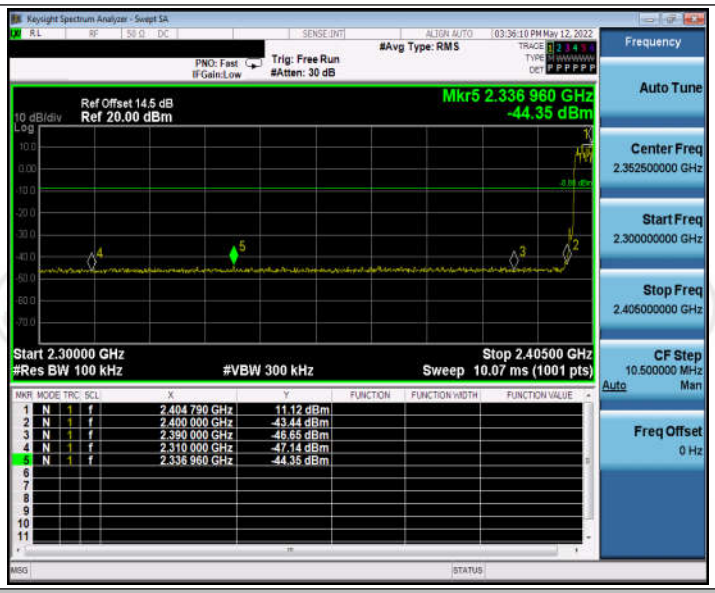
3DH5_Ant1_Low_2402



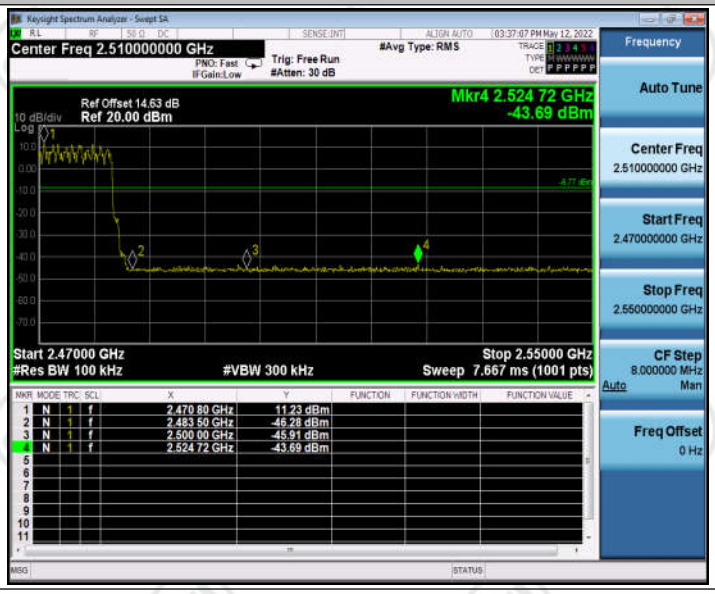
3DH5_Ant1_High_2480



3DH5_Ant1_Low_Hop_2402



3DH5_Ant1_High_Hop_2480

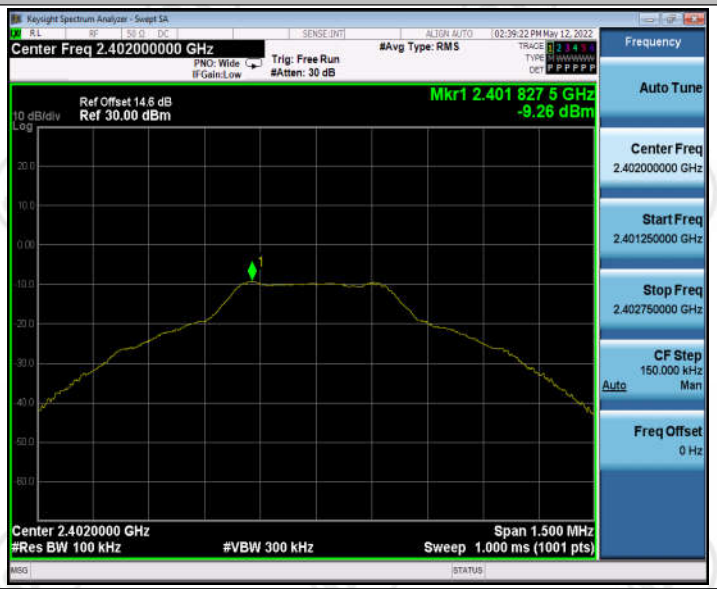
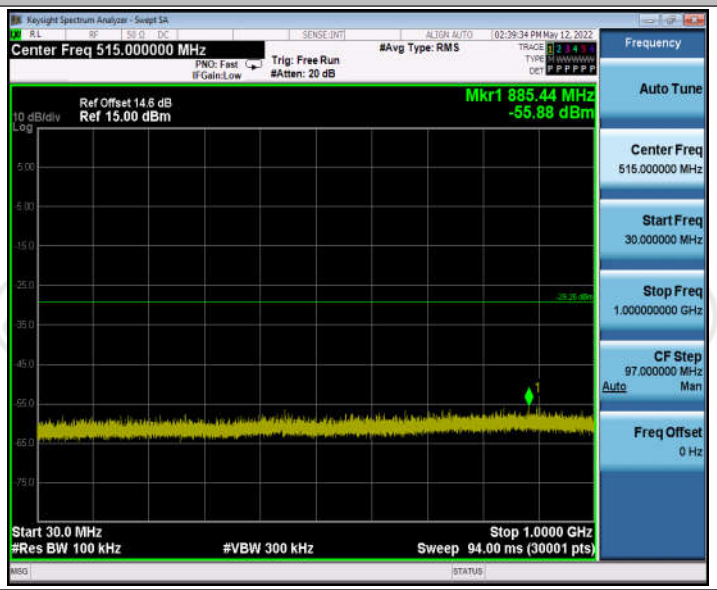


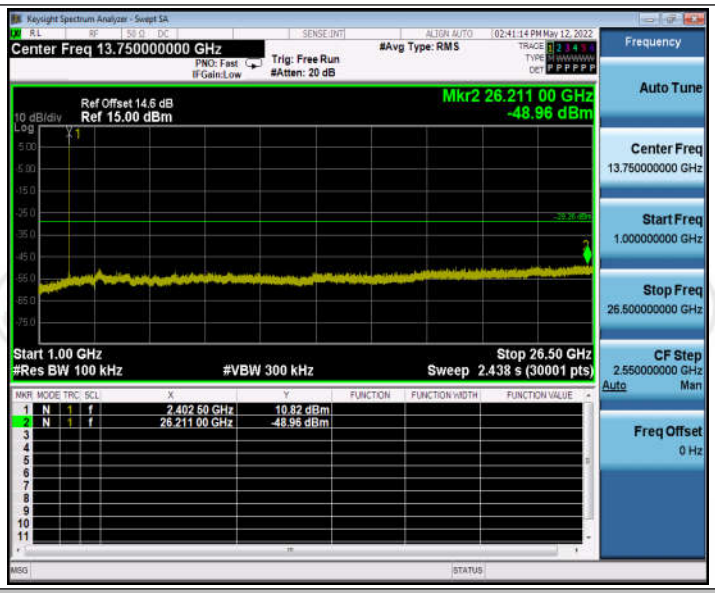
Appendix H: Conducted Spurious Emission

Test Result

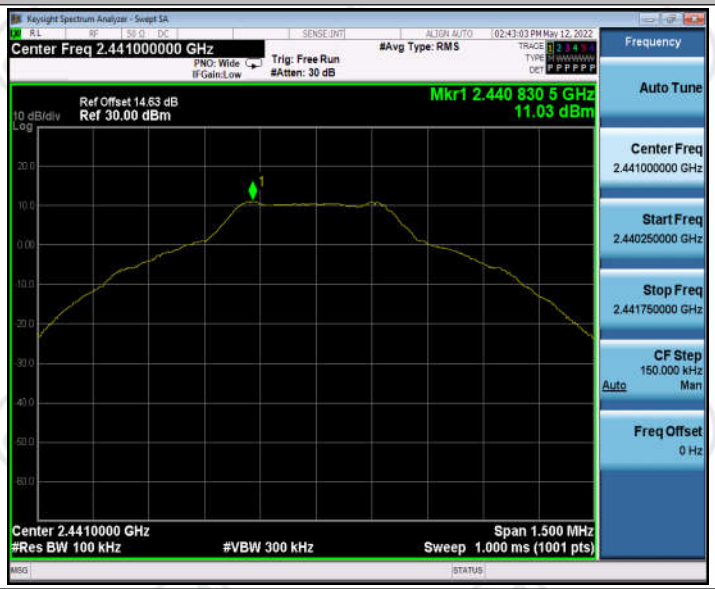
Test Mode	Antenna	Frequency[MHz]	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	2402	Reference	-9.26	-9.26	---	PASS
			30~1000	---	-55.88	≤-29.26	PASS
			1000~26500	---	-48.96	≤-29.26	PASS
		2441	Reference	11.03	11.03	---	PASS
			30~1000	---	-56.21	≤-8.97	PASS
			1000~26500	---	-47.68	≤-8.97	PASS
		2480	Reference	10.61	10.61	---	PASS
			30~1000	---	-54.76	≤-9.39	PASS
			1000~26500	---	-48.6	≤-9.39	PASS
2DH5	Ant1	2402	Reference	11.00	11.00	---	PASS
			30~1000	---	-55.55	≤-9	PASS
			1000~26500	---	-48.28	≤-9	PASS
		2441	Reference	11.07	11.07	---	PASS
			30~1000	---	-55.31	≤-8.93	PASS
			1000~26500	---	-47.58	≤-8.93	PASS
		2480	Reference	10.64	10.64	---	PASS
			30~1000	---	-52.8	≤-9.36	PASS
			1000~26500	---	-48.24	≤-9.36	PASS
3DH5	Ant1	2402	Reference	8.48	8.48	---	PASS
			30~1000	---	-56.01	≤-11.52	PASS
			1000~26500	---	-48.24	≤-11.52	PASS
		2441	Reference	11.01	11.01	---	PASS
			30~1000	---	-55.73	≤-8.99	PASS
			1000~26500	---	-48.1	≤-8.99	PASS
		2480	Reference	10.58	10.58	---	PASS
			30~1000	---	-50.49	≤-9.42	PASS
			1000~26500	---	-48.37	≤-9.42	PASS

Test Graphs

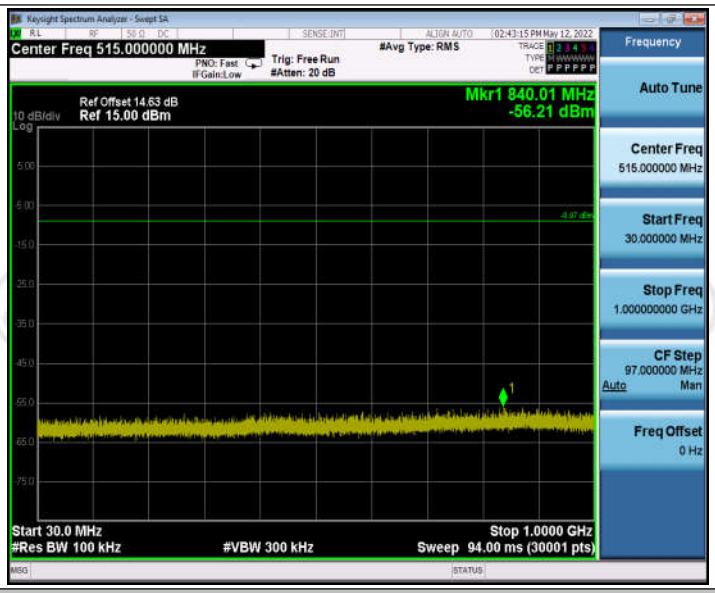
DH5_Ant1_2402_0~Reference

DH5_Ant1_2402_30~1000

DH5_Ant1_2402_1000~26500



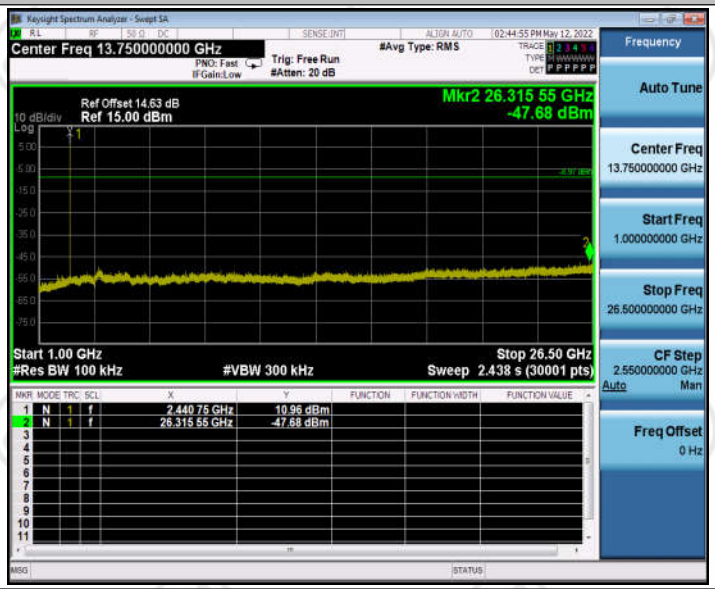
DH5_Ant1_2441_0~Reference



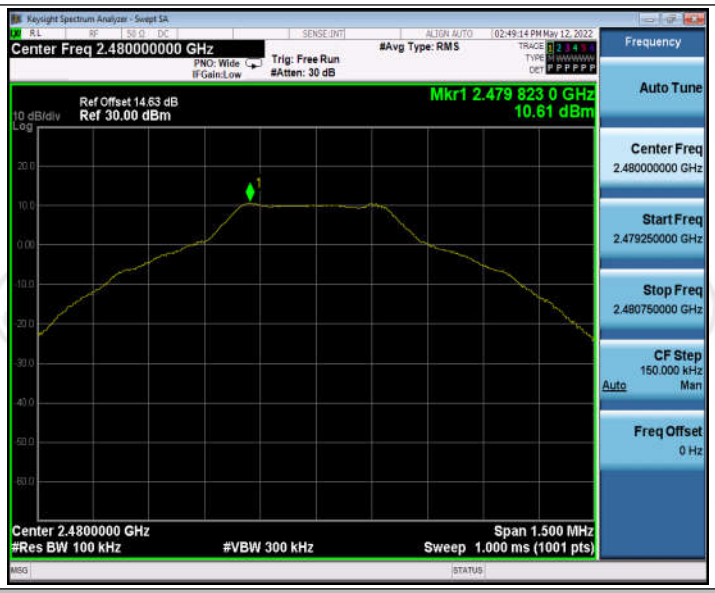
DH5_Ant1_2441_30~1000



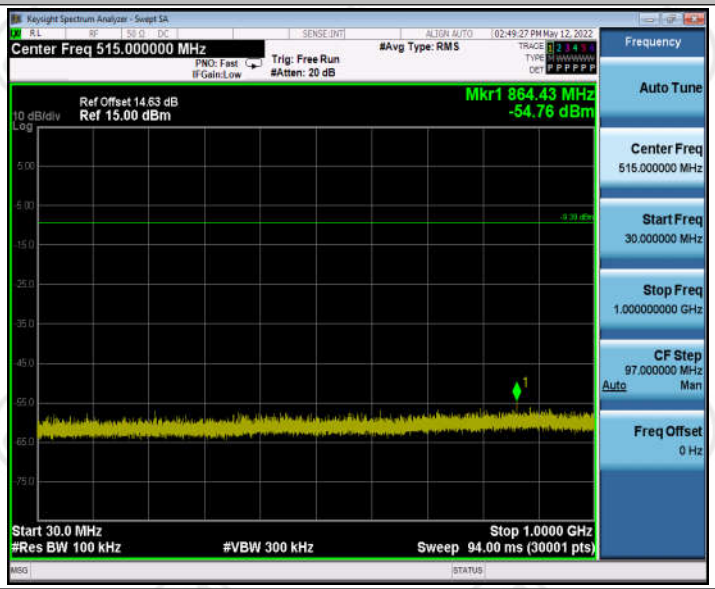
DH5_Ant1_2441_1000~26500



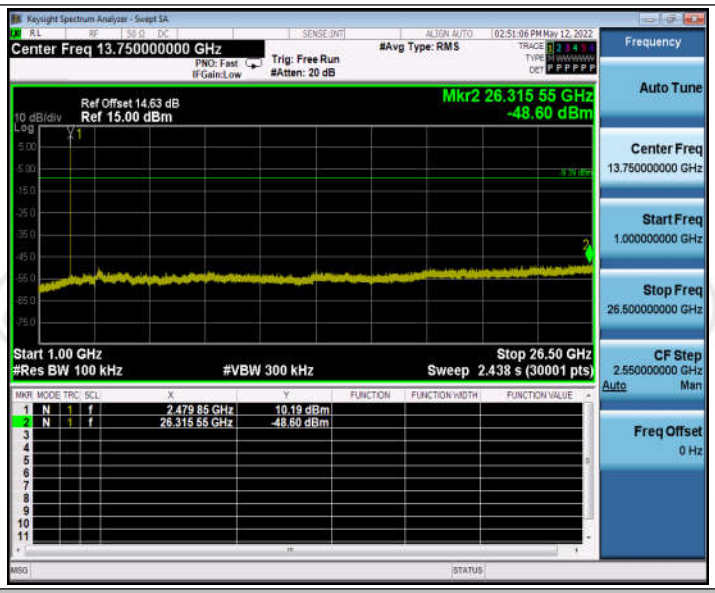
DH5_Ant1_2480_0~Reference



DH5_Ant1_2480_30~1000

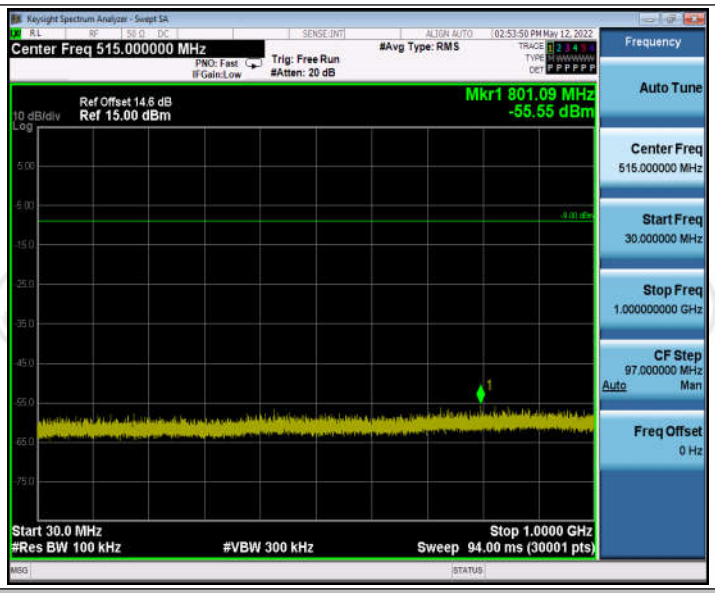


DH5_Ant1_2480_1000~26500

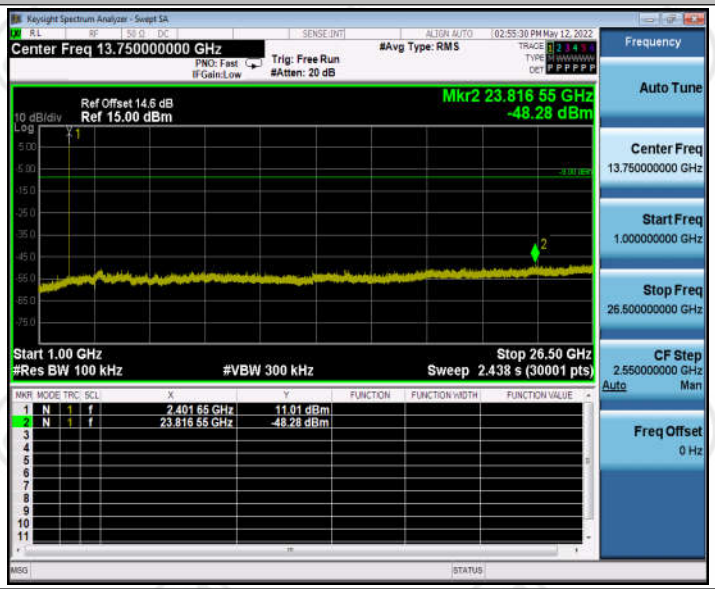


2DH5_Ant1_2402_0~Reference

2DH5_Ant1_2402_30~1000

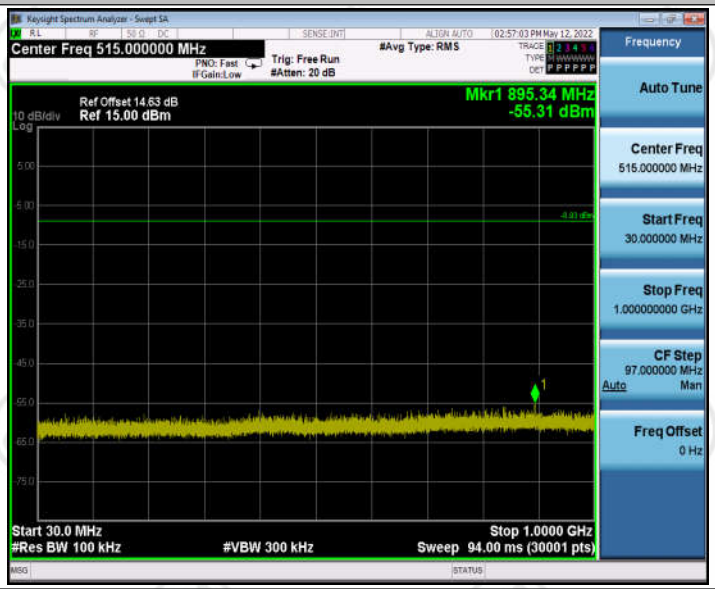


2DH5_Ant1_2402_1000~26500

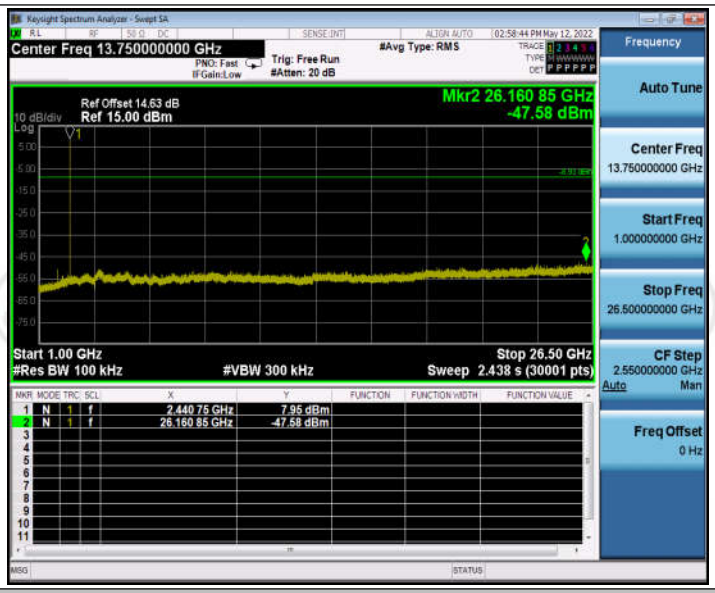


2DH5_Ant1_2441_0~Reference

2DH5_Ant1_2441_30~1000

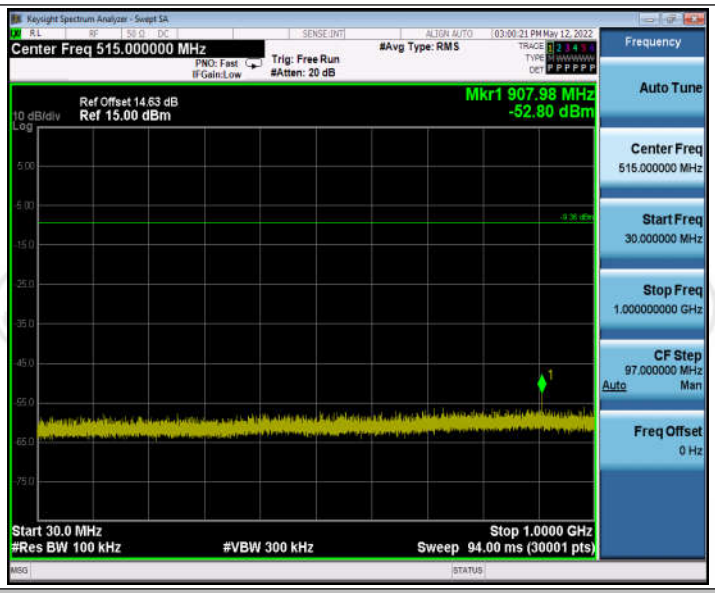


2DH5_Ant1_2441_1000~26500

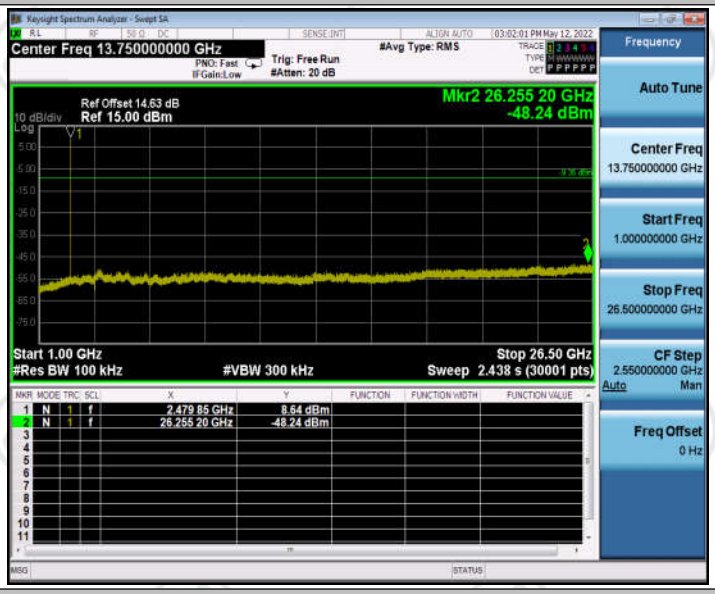


2DH5_Ant1_2480_0~Reference

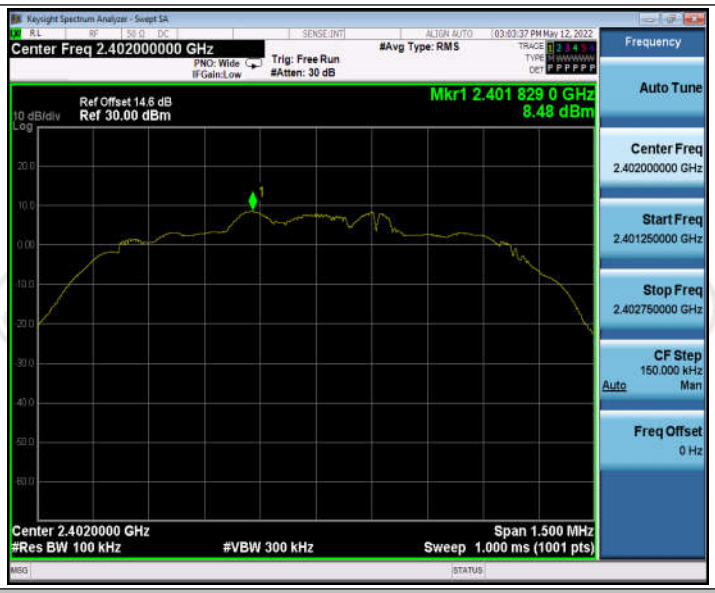
2DH5_Ant1_2480_30~1000



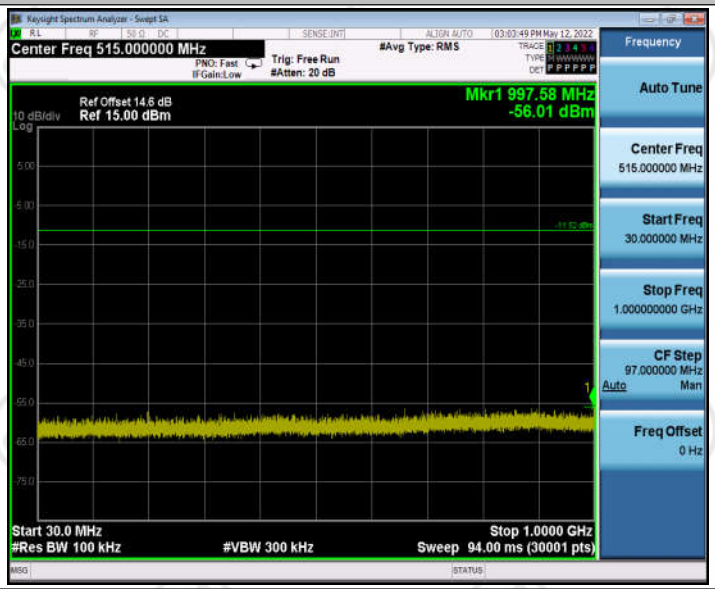
2DH5_Ant1_2480_1000~26500



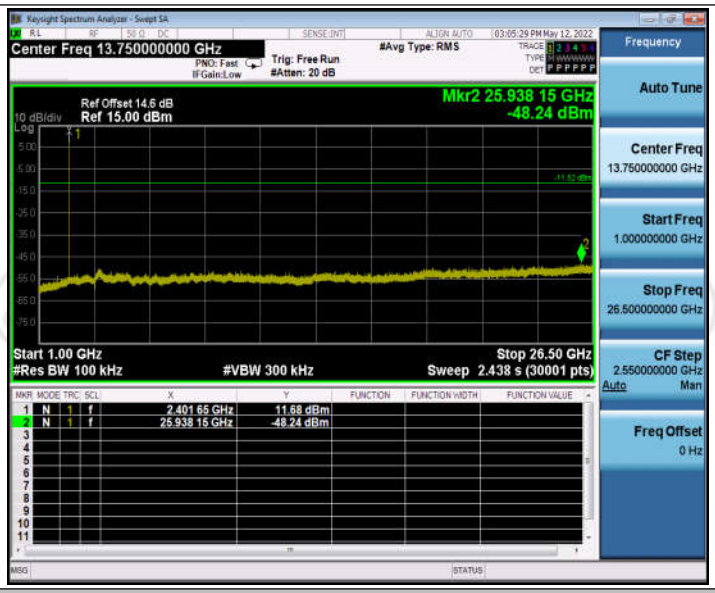
3DH5_Ant1_2402_0~Reference



3DH5_Ant1_2402_30~1000

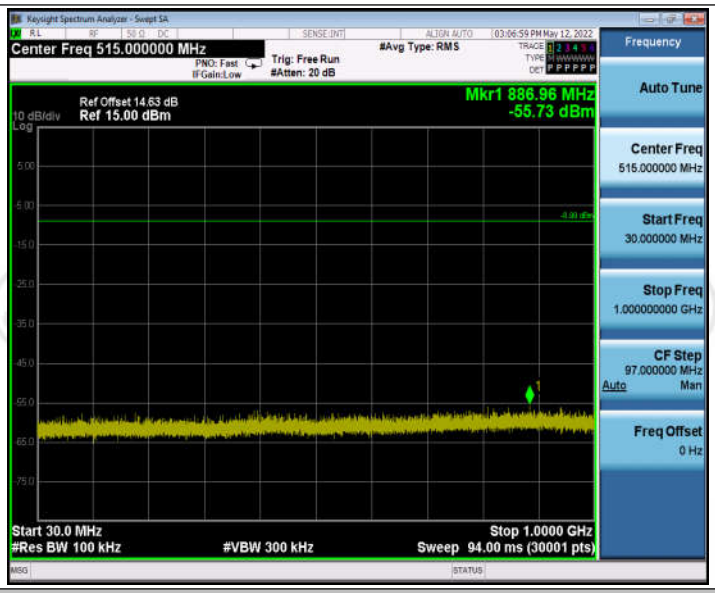


3DH5_Ant1_2402_1000~26500

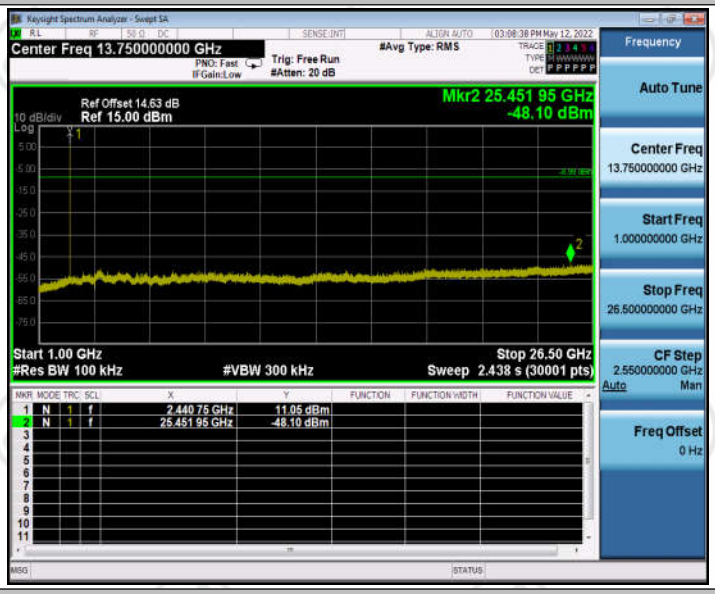


3DH5_Ant1_2441_0~Reference

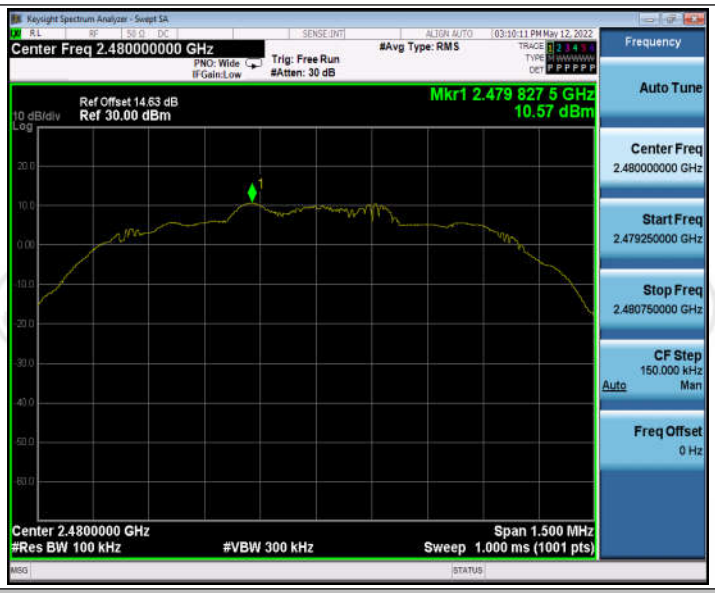
3DH5_Ant1_2441_30~1000



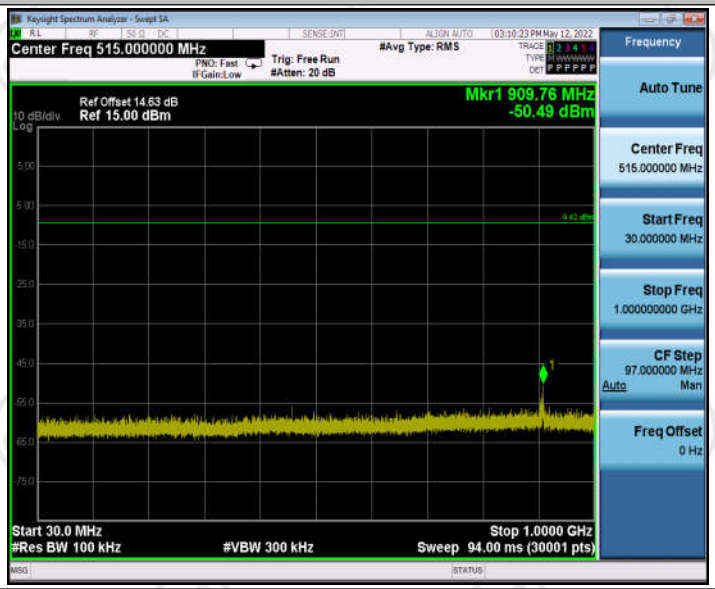
3DH5_Ant1_2441_1000~26500



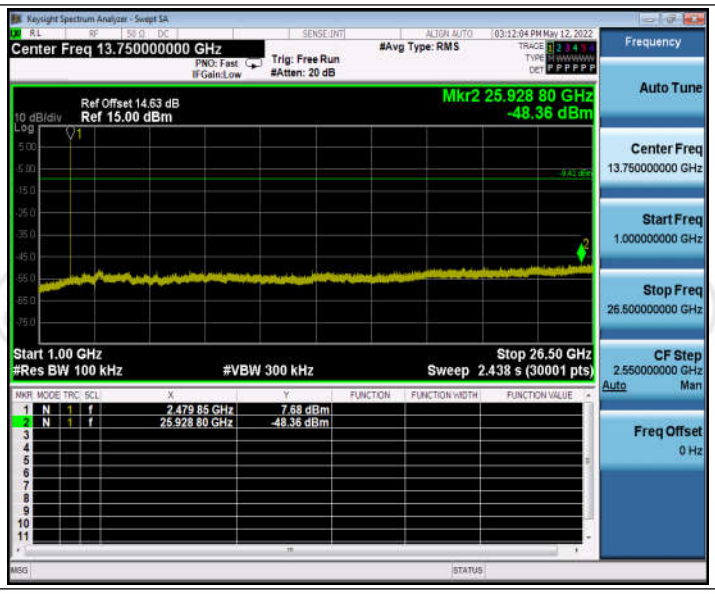
3DH5_Ant1_2480_0~Reference



3DH5_Ant1_2480_30~1000



3DH5_Ant1_2480_1000~26500

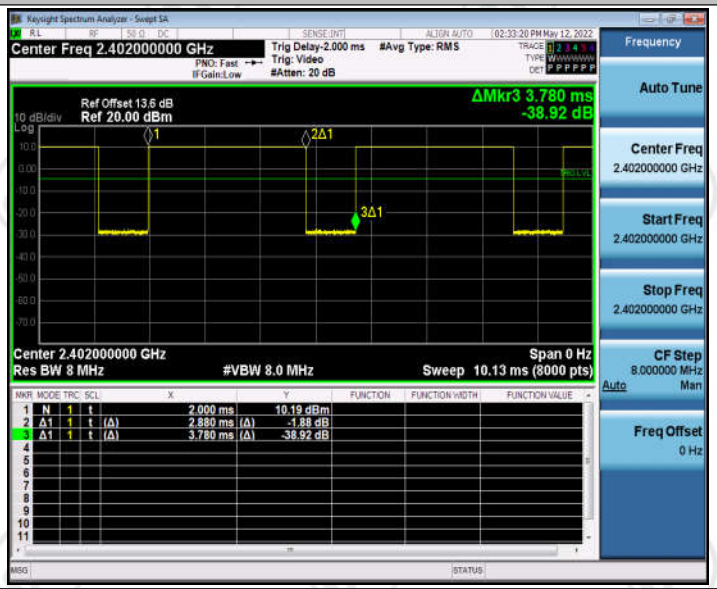
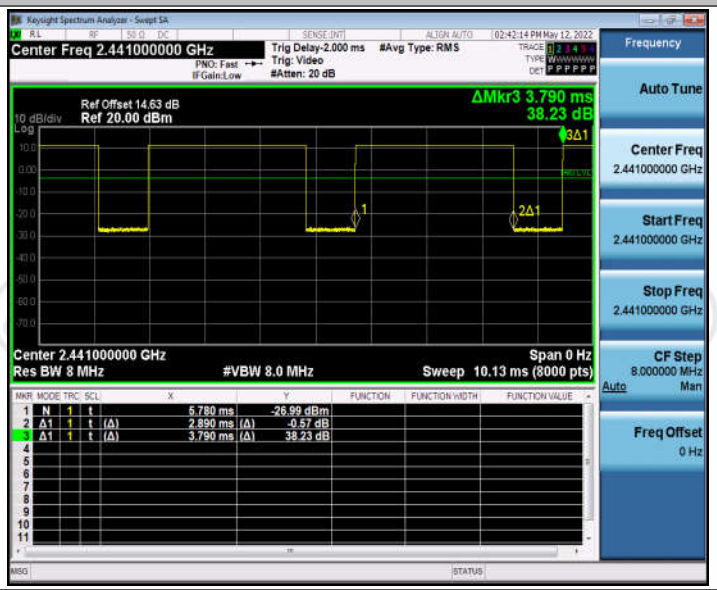

Keysight Spectrum Analyzer - Swept SA
Center Freq 13.750000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
03:12:04 PM May 12, 2022
Frequency
Ref Offset 14.63 dB
10 dB/div
Ref 15.00 dBm
Mkr2 25.928 80 GHz
-48.36 dBm
Start 1.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep 2.438 s (30001 pts)
1 N 1 f 2.479 85 GHz 7.68 dBm
2 N 1 f 25.928 80 GHz -48.36 dBm
Auto Tune
Center Freq
13.750000000 GHz
Start Freq
1.000000000 GHz
Stop Freq
26.500000000 GHz
CF Step
2.550000000 GHz
Auto
Man
Freq Offset
0 Hz

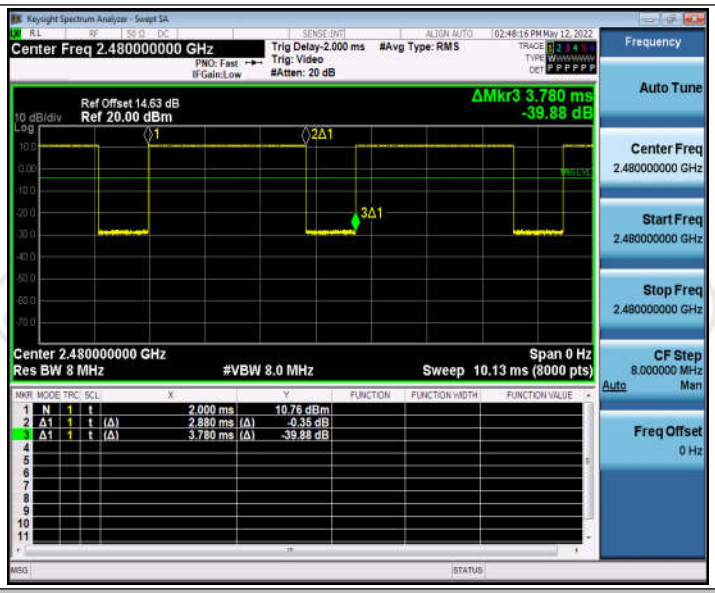
Appendix I: Duty Cycle

Test Result

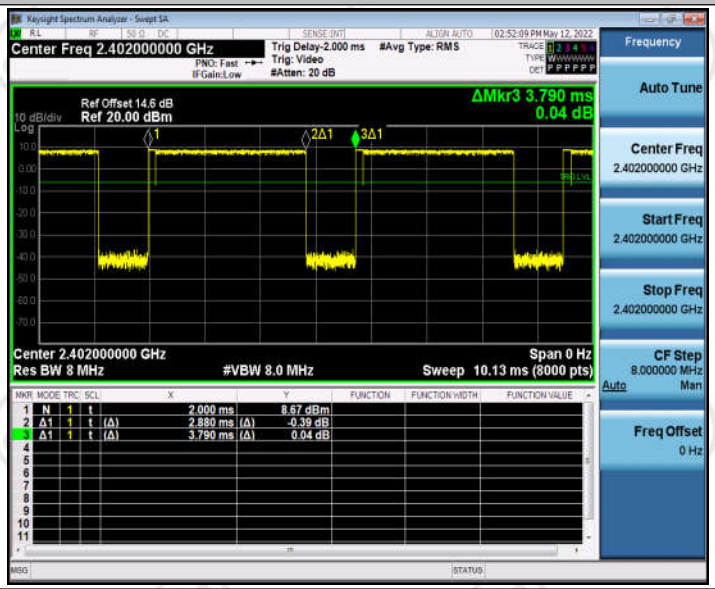
Test Mode	Antenna	Frequency[MHz]	ON Time [ms]	Period [ms]	Duty Cycle [%]	Duty Cycle Factor[dB]
DH5	Ant1	2402	2.88	3.78	76.19	1.18
		2441	2.89	3.79	76.25	1.18
		2480	2.88	3.78	76.19	1.18
2DH5	Ant1	2402	2.88	3.79	75.99	1.19
		2441	2.89	3.80	76.05	1.19
		2480	2.89	3.79	76.25	1.18
3DH5	Ant1	2402	2.89	3.79	76.25	1.18
		2441	2.89	3.80	76.05	1.19
		2480	2.89	3.79	76.25	1.18

Test Graphs

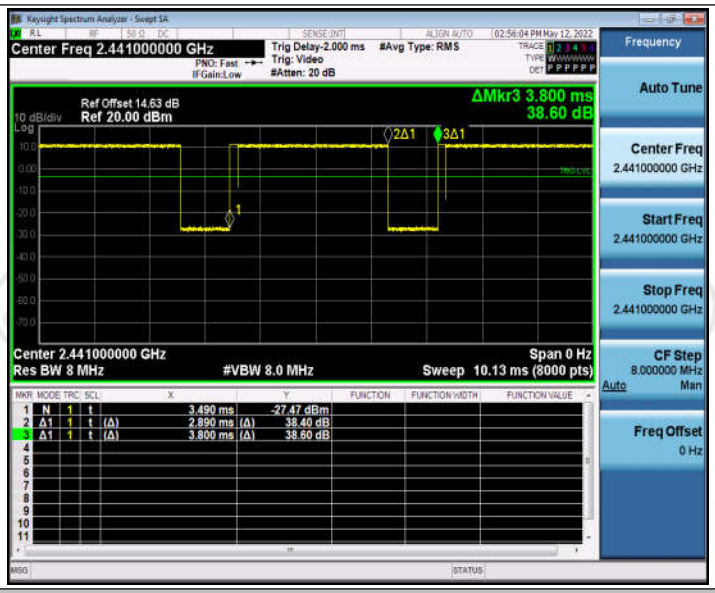
DH5_Ant1_2402

DH5_Ant1_2441

DH5_Ant1_2480



2DH5_Ant1_2402



2DH5_Ant1_2441



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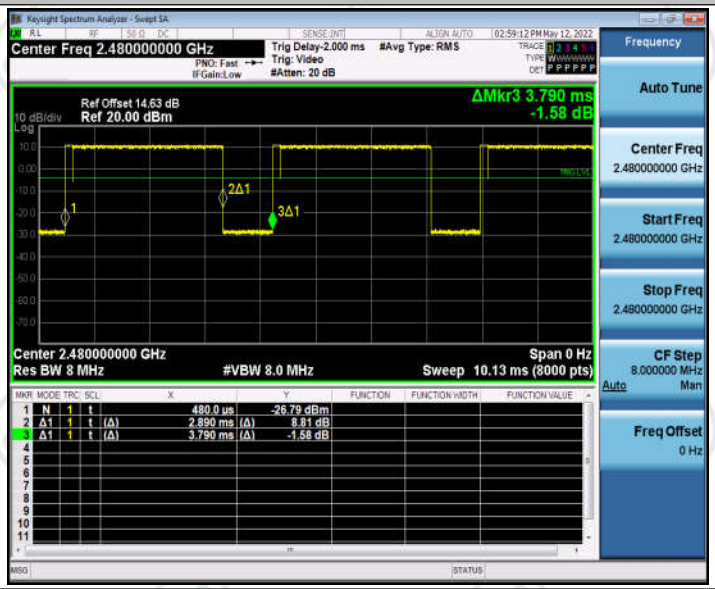

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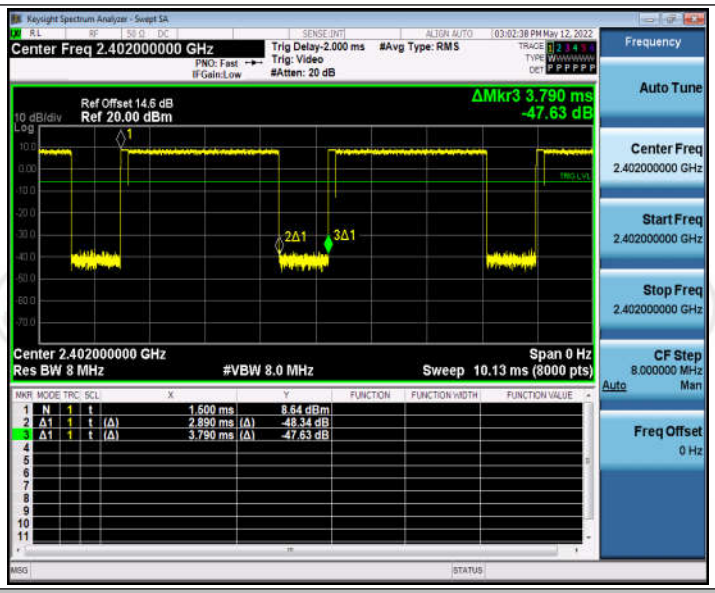

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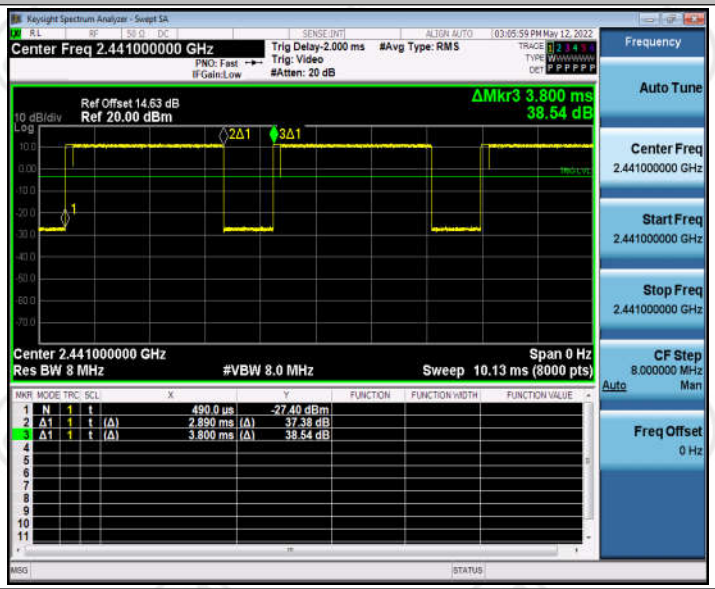

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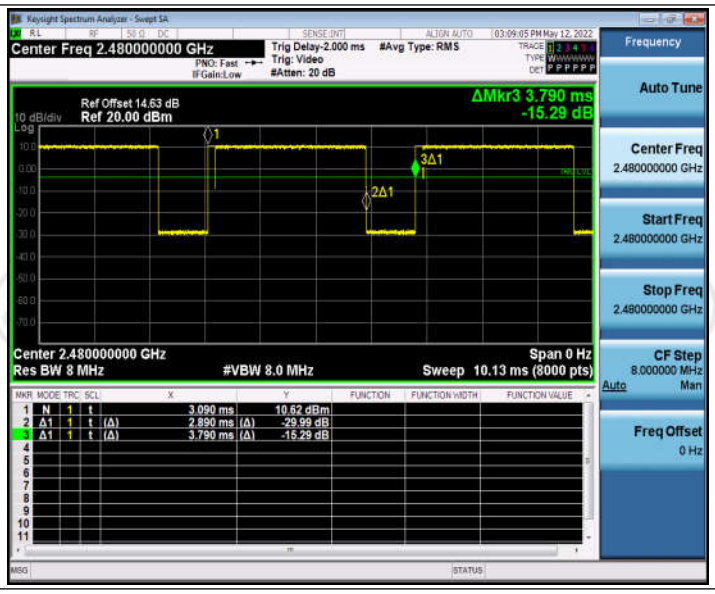

*** End of Report ***