Appendix: Bluetooth Classic

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Appendix A: 20dB Emission Bandwidth

Test Result

TestMode	Antenna	Channel	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.888	2401.556	2402.444	---	PASS
		2441	0.912	2440.547	2441.459	---	PASS
		2480	0.915	2479.541	2480.456	---	PASS
2DH5	Ant1	2402	1.341	2401.346	2402.687	---	PASS
		2441	1.347	2440.337	2441.684	---	PASS
		2480	1.329	2479.334	2480.663	---	PASS
3DH5	Ant1	2402	1.329	2401.334	2402.663	---	PASS
		2441	1.275	2440.352	2441.627	---	PASS
		2480	1.332	2479.325	2480.657	---	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: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 10/10
05:09:15 PM Nov 25, 2021
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
Ref Offset 0.92 dB
10 dB/div
Ref 23.92 dBm
ΔMkr3 1.332 MHz
0.829 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 2.479 325 GHz -23.194 dBm
2 N 1 f 2.480 168 GHz -2.154 dBm
3 Δ1 1 f (Δ) 1.332 MHz (Δ) 0.829 dB
MSG
STATUS

Appendix B: Occupied Channel Bandwidth

Test Result

TestMode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.85144	2401.587	2402.438	---	PASS
		2441	0.85229	2440.580	2441.432	---	PASS
		2480	0.86611	2479.562	2480.428	---	PASS
2DH5	Ant1	2402	1.2017	2401.411	2402.612	---	PASS
		2441	1.1952	2440.408	2441.603	---	PASS
		2480	1.2035	2479.396	2480.600	---	PASS
3DH5	Ant1	2402	1.1884	2401.428	2402.616	---	PASS
		2441	1.2101	2440.397	2441.607	---	PASS
		2480	1.2270	2479.380	2480.607	---	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 - Occupied BW
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold: 10/10
#Atten: 40 dB
Radio Std: None
Radio Device: BTS
05:09:27 PM Nov 25, 2021
Frequency
Ref Offset 0.92 dB
10 dB/div
Ref 30.00 dBm
Mkr1 2.479946 GHz
-4.2156 dBm
Center Freq
2.480000000 GHz
Center 2.48 GHz
#Res BW 20 kHz
#VBW 75 kHz
Span 3 MHz
Sweep 7.133 ms
CF Step
300.000 kHz
Auto
Man
Occupied Bandwidth
1.2270 MHz
Total Power
8.08 dBm
Transmit Freq Error
-6.987 kHz
OBW Power
99.00 %
x dB Bandwidth
1.425 MHz
x dB
-26.00 dB
Freq Offset
0 Hz
MSG
STATUS

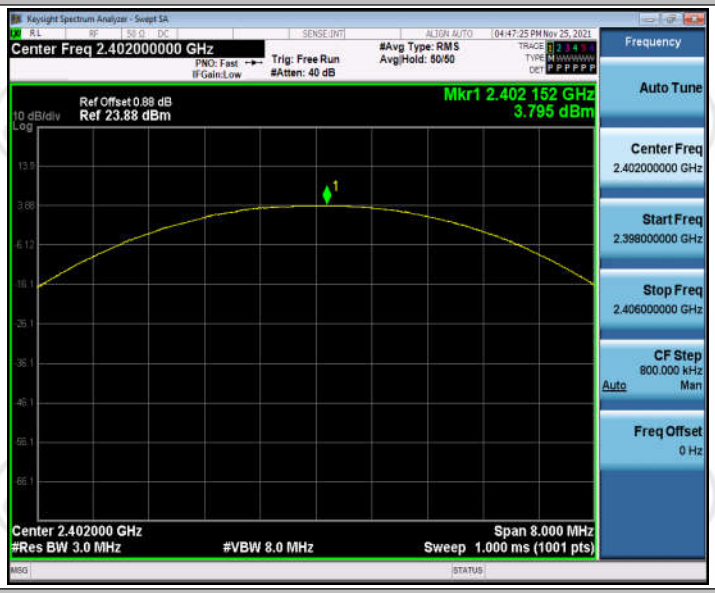
Appendix C: Maximum conducted output power

Test Result

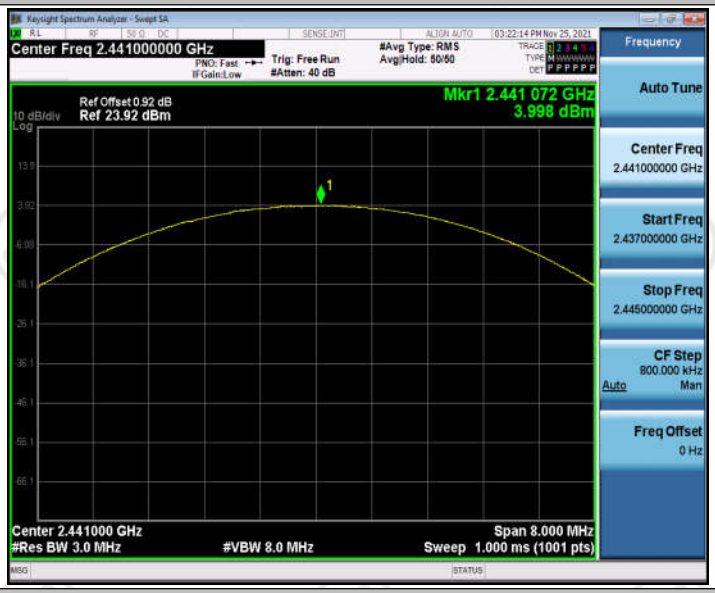
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	2402	3.8	<=20.97	PASS
		2441	4	<=20.97	PASS
		2480	4.1	<=20.97	PASS
2DH5	Ant1	2402	5.11	<=20.97	PASS
		2441	5.27	<=20.97	PASS
		2480	5.62	<=20.97	PASS
3DH5	Ant1	2402	5.34	<=20.97	PASS
		2441	5.71	<=20.97	PASS
		2480	6.04	<=20.97	PASS

Test Graphs

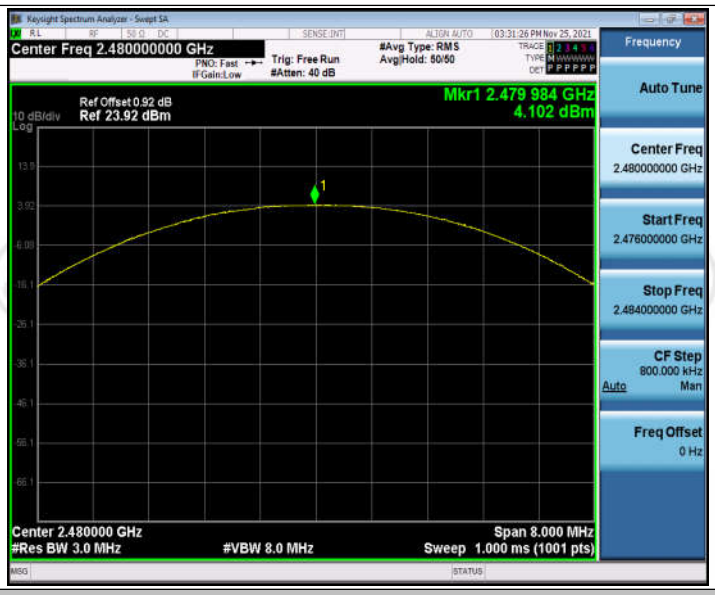
DH5_Ant1_2402



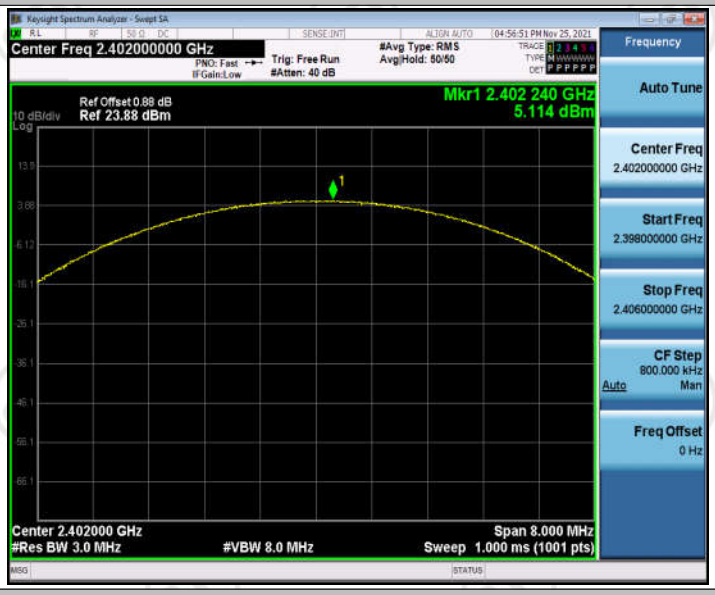
DH5_Ant1_2441



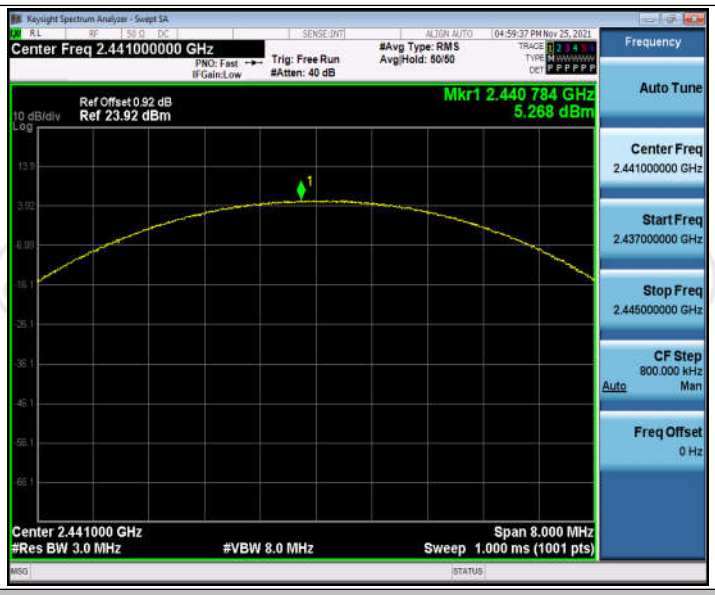
DH5_Ant1_2480



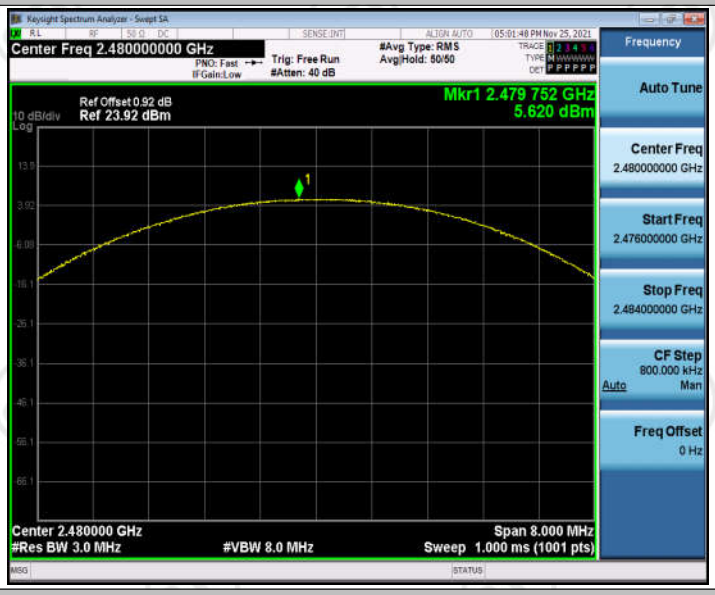
2DH5_Ant1_2402



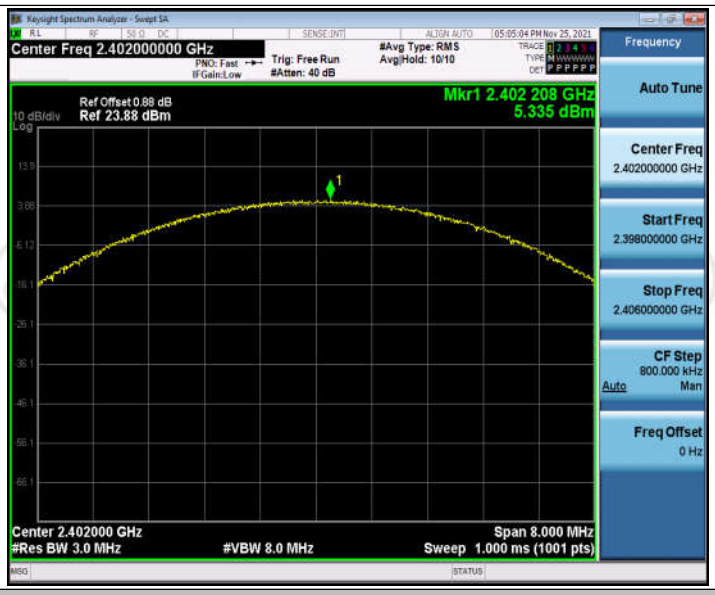
2DH5_Ant1_2441



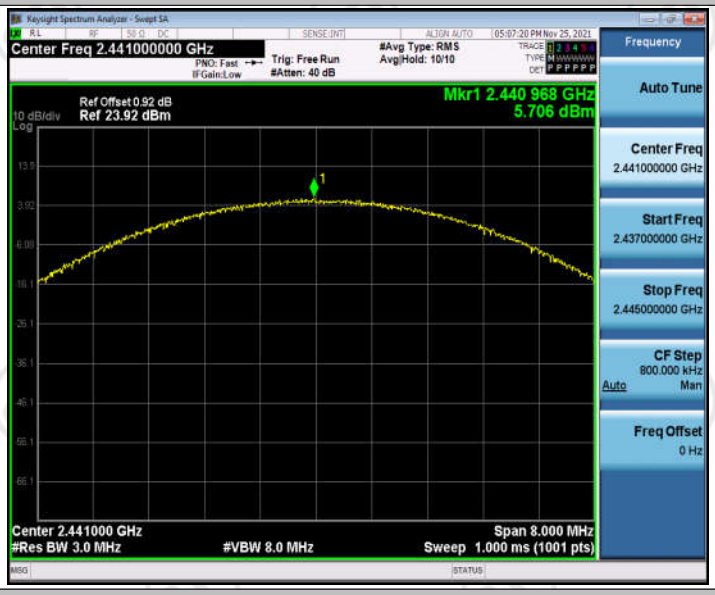
2DH5_Ant1_2480



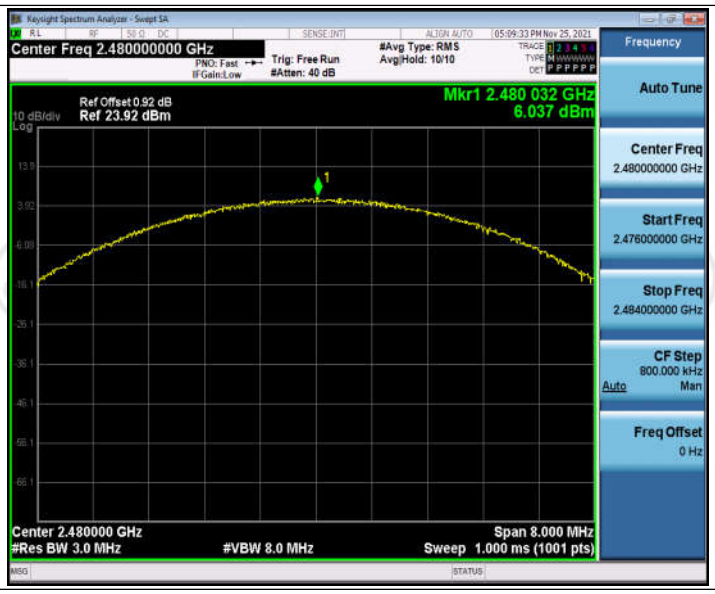
3DH5_Ant1_2402



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
Avg|Hold: 10/10
05:09:33 PM Nov 25, 2021
Ref Offset 0.92 dB
10 dB/div
Ref 23.92 dBm
Log
Mkr1 2.480 032 GHz
6.037 dBm
Center 2.480000 GHz
#Res BW 3.0 MHz
#VBW 8.0 MHz
Span 8.000 MHz
Sweep 1.000 ms (1001 pts)
Frequency
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

Appendix D: Carrier frequency separation

Test Result

TestMode	Antenna	Channel	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant1	Hop_2402	0.93	>=0.915	PASS
		Hop_2441	0.948	>=0.915	PASS
		Hop_2480	1.106	>=0.915	PASS
2DH5	Ant1	Hop_2402	0.986	>=0.898	PASS
		Hop_2441	1.142	>=0.898	PASS
		Hop_2480	0.96	>=0.898	PASS
3DH5	Ant1	Hop_2402	1.144	>=0.888	PASS
		Hop_2441	1.064	>=0.888	PASS
		Hop_2480	0.996	>=0.888	PASS

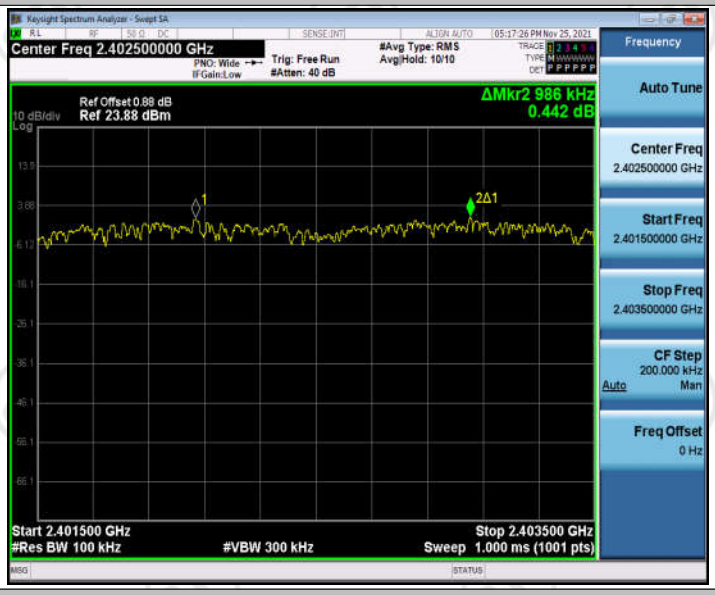
Test Graphs

DH5_Ant1_Hop_2402

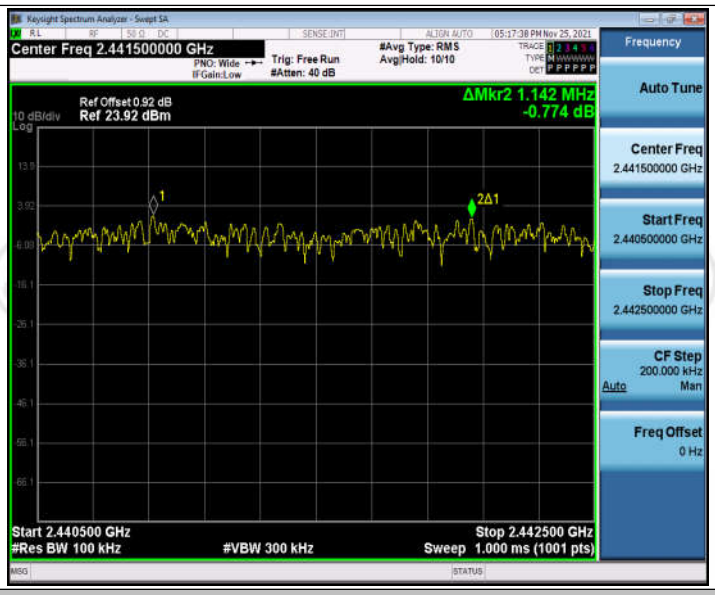
DH5_Ant1_Hop_2441

DH5_Ant1_Hop_2480

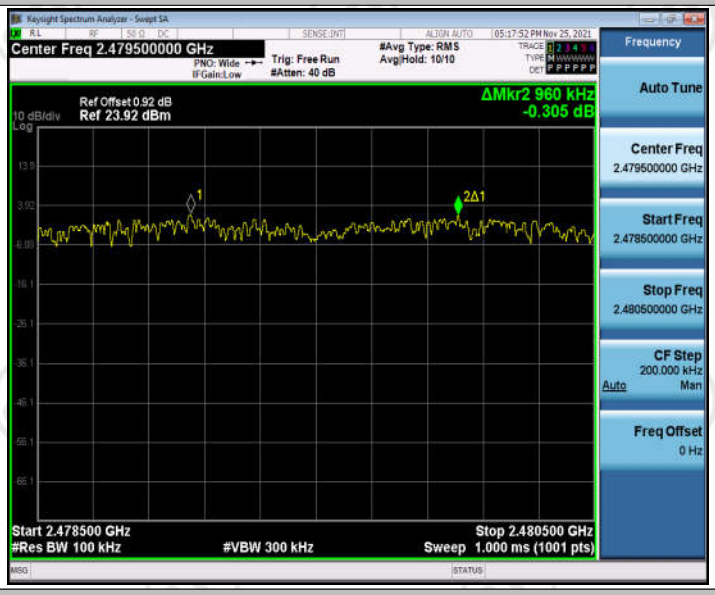
2DH5_Ant1_Hop_2402



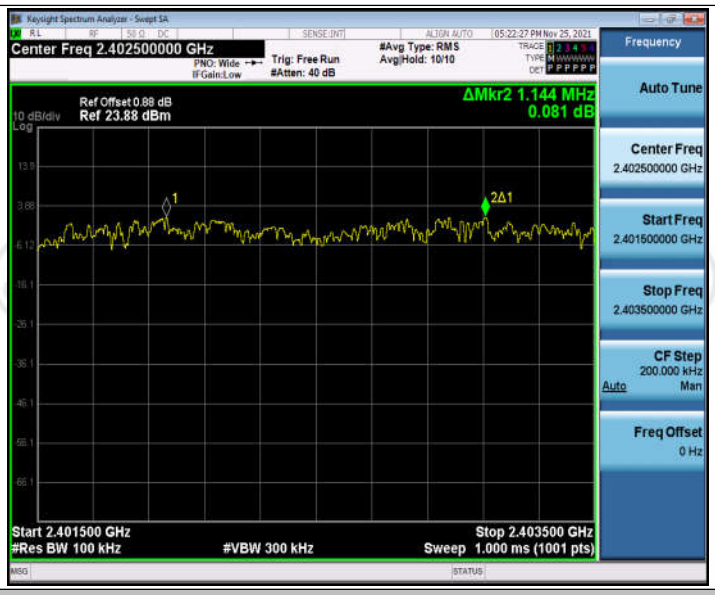
2DH5_Ant1_Hop_2441



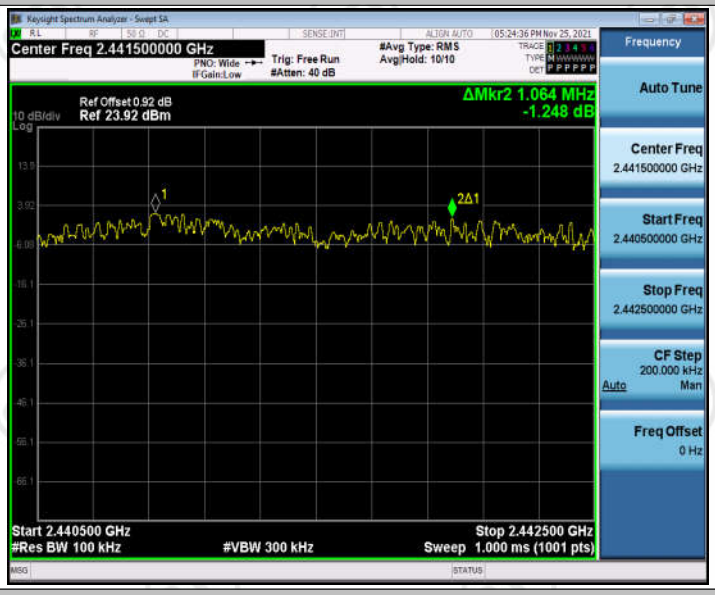
2DH5_Ant1_Hop_2480



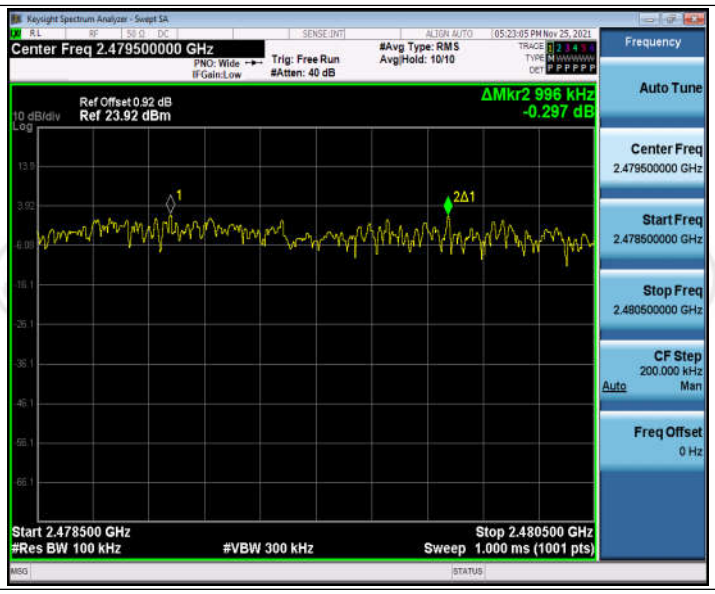
3DH5_Ant1_Hop_2402



3DH5_Ant1_Hop_2441



3DH5_Ant1_Hop_2480

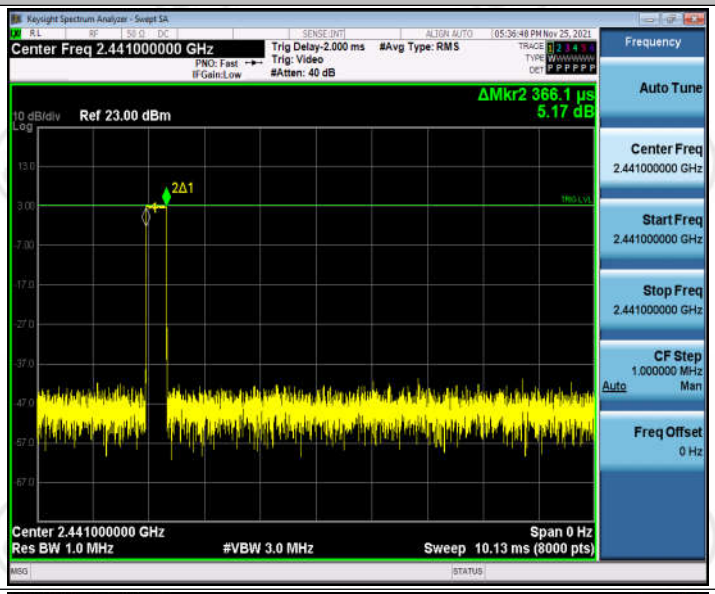
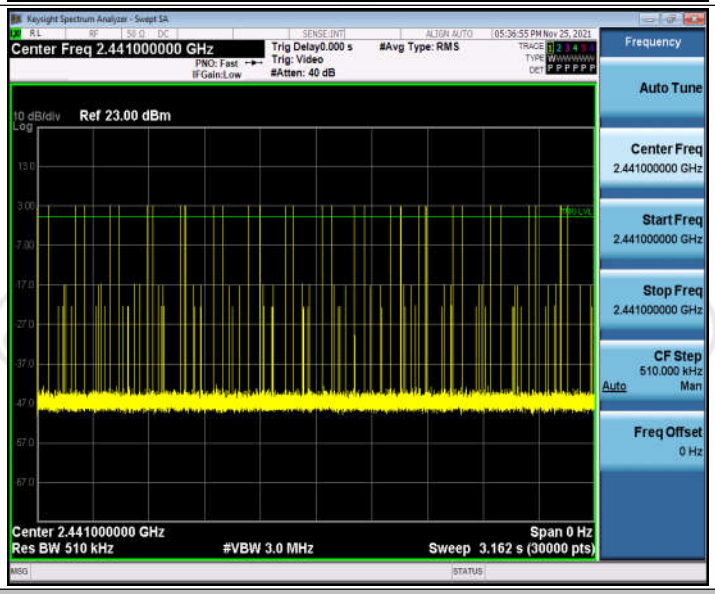

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.479500000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 10/10
05:23:05 PM Nov 25, 2021
Ref Offset 0.92 dB
10 dB/div
Ref 23.92 dBm
Log
ΔMkr2 996 kHz
-0.297 dB
1
2Δ1
Start 2.478500 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.480500 GHz
Sweep 1.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.479500000 GHz
Start Freq
2.478500000 GHz
Stop Freq
2.480500000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

Appendix E: Time of occupancy

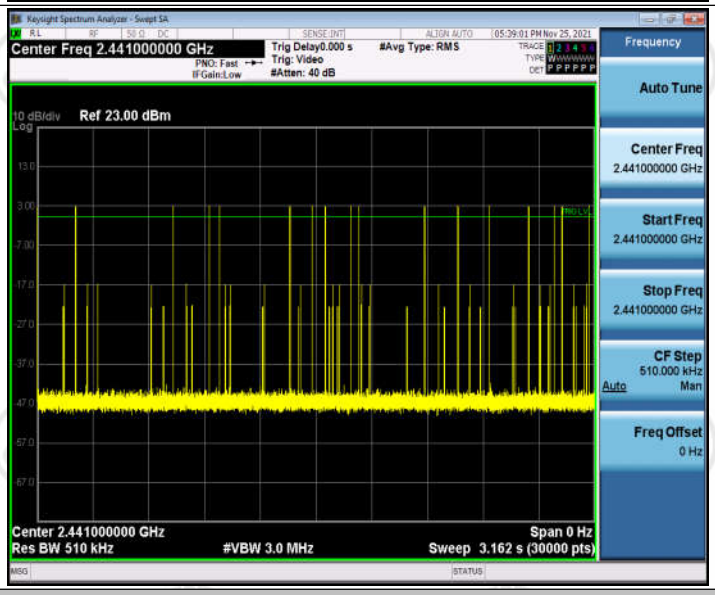
Test Result

TestMode	Antenna	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.37	320	0.117	<=0.4	PASS
DH3	Ant1	Hop	1.62	170	0.276	<=0.4	PASS
DH5	Ant1	Hop	2.87	120	0.344	<=0.4	PASS
2DH1	Ant1	Hop	0.26	330	0.087	<=0.4	PASS
2DH3	Ant1	Hop	0.89	180	0.16	<=0.4	PASS
2DH5	Ant1	Hop	2.87	110	0.316	<=0.4	PASS
3DH1	Ant1	Hop	0.22	320	0.072	<=0.4	PASS
3DH3	Ant1	Hop	0.64	170	0.109	<=0.4	PASS
3DH5	Ant1	Hop	2.87	100	0.287	<=0.4	PASS

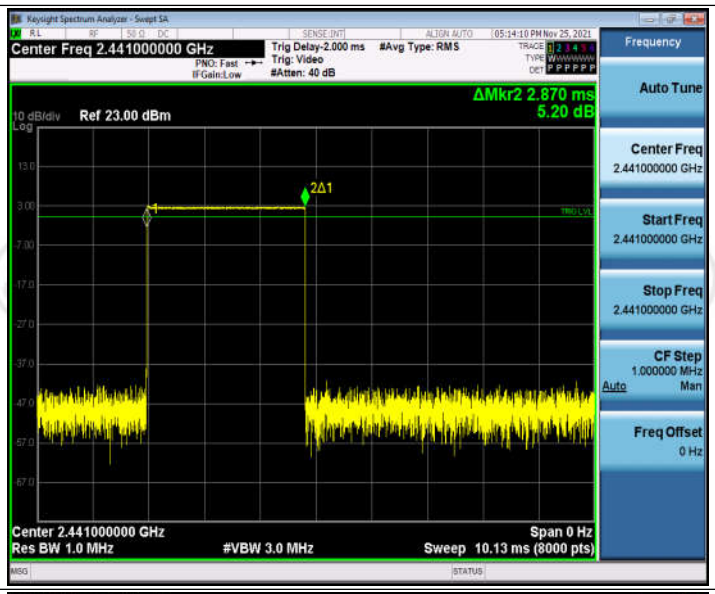
Test Graphs

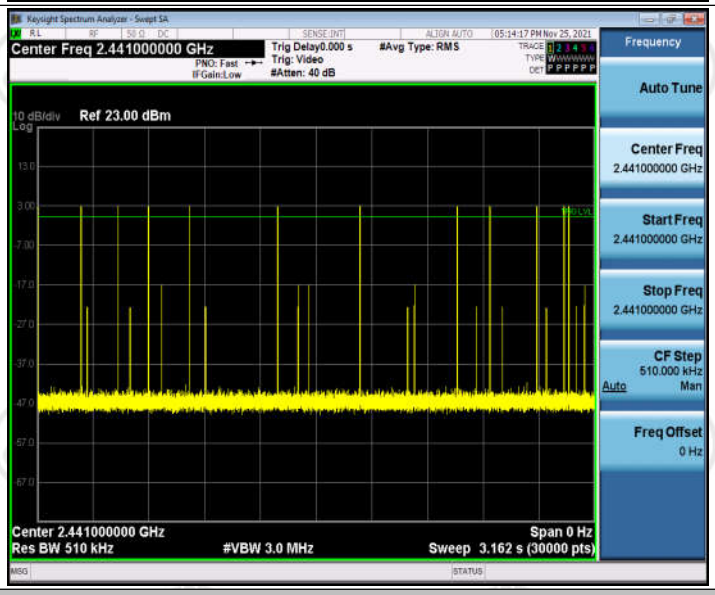
DH1_Ant1_Hop


DH3_Ant1_Hop

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.441000000 GHz
Trig Delay-2.000 ms
#Avg Type: RMS
Trig: Video
#Atten: 40 dB
PNO: Fast
IFGain:Low
ΔMkr2 1.623 ms
14.65 dB
10 dB/div
Ref 23.00 dBm
Log
2Δ1
1
Center 2.441000000 GHz
Span 0 Hz
Res BW 1.0 MHz
#VBW 3.0 MHz
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

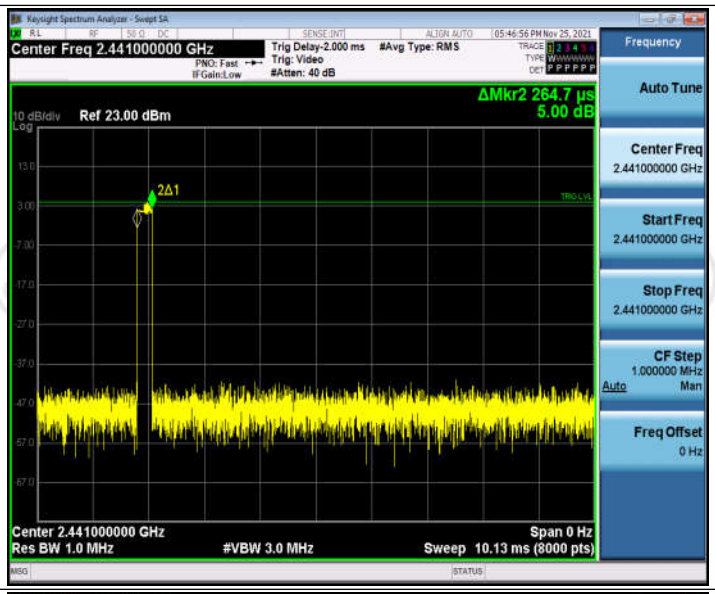

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.441000000 GHz
Trig Delay0.000 s
#Avg Type: RMS
Trig: Video
#Atten: 40 dB
PNO: Fast
IFGain:Low
10 dB/div
Ref 23.00 dBm
Log
Center 2.441000000 GHz
Span 0 Hz
Res BW 510 kHz
#VBW 3.0 MHz
Sweep 3.162 s (30000 pts)
Frequency
Auto Tune
Center Freq
2.441000000 GHz
Start Freq
2.441000000 GHz
Stop Freq
2.441000000 GHz
CF Step
510.000 kHz
Auto
Man
Freq Offset
0 Hz

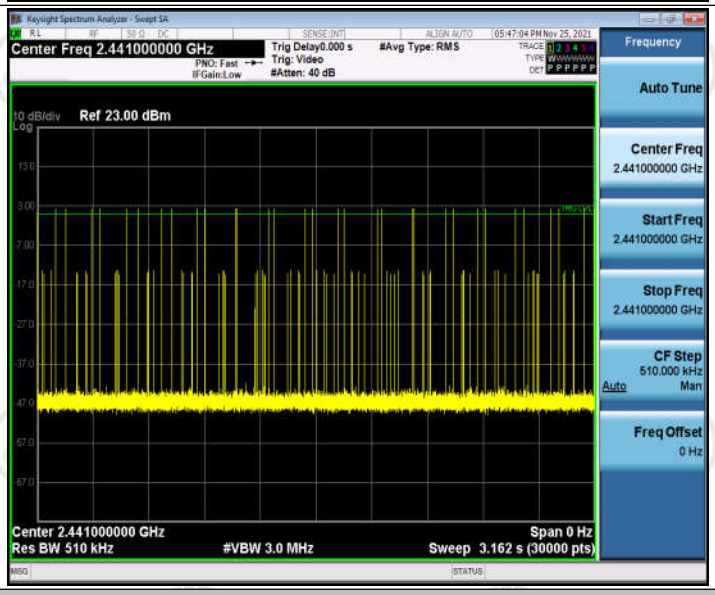
DH5_Ant1_Hop



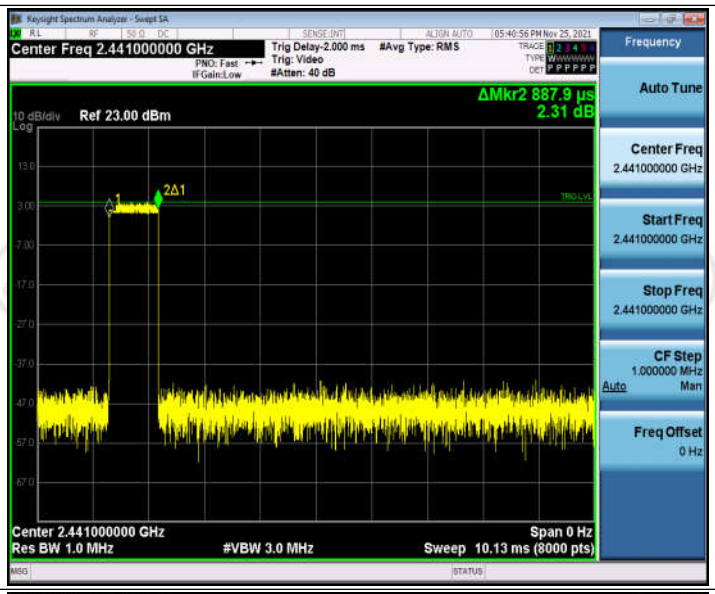


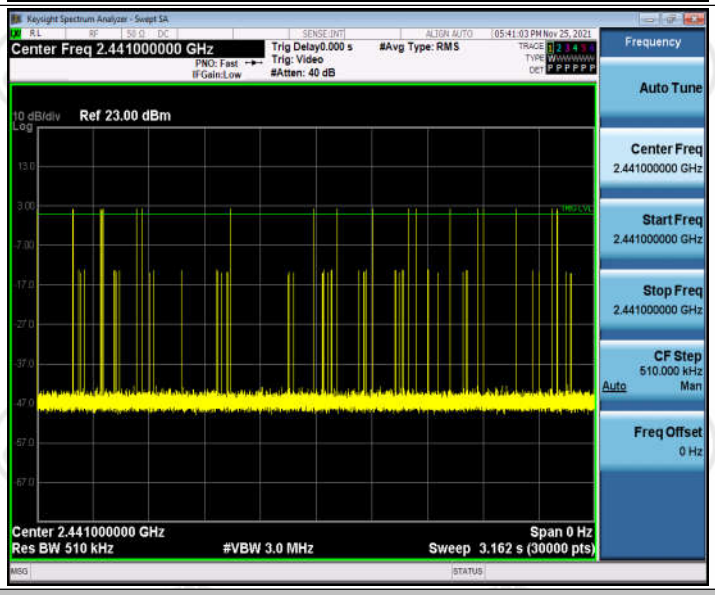
2DH1_Ant1_Hop



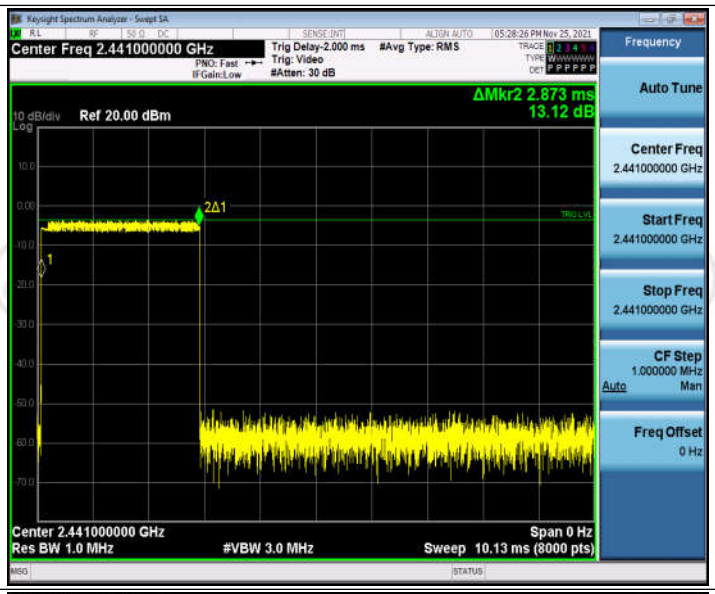


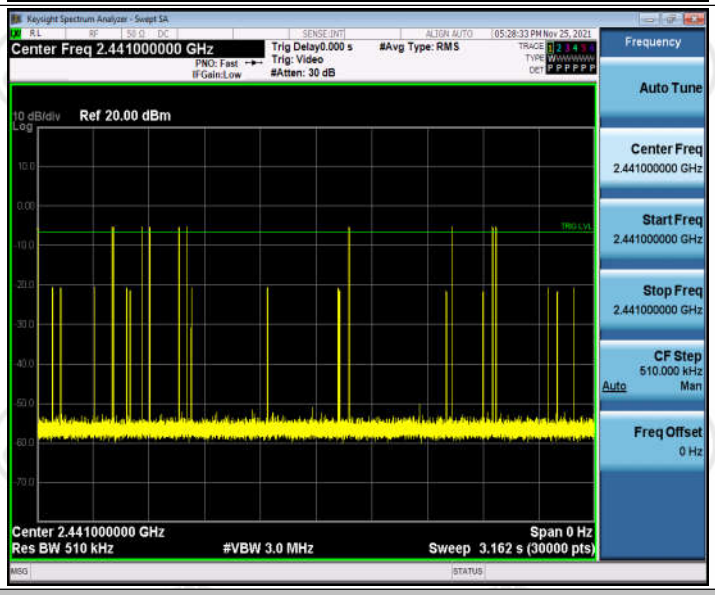
2DH3_Ant1_Hop



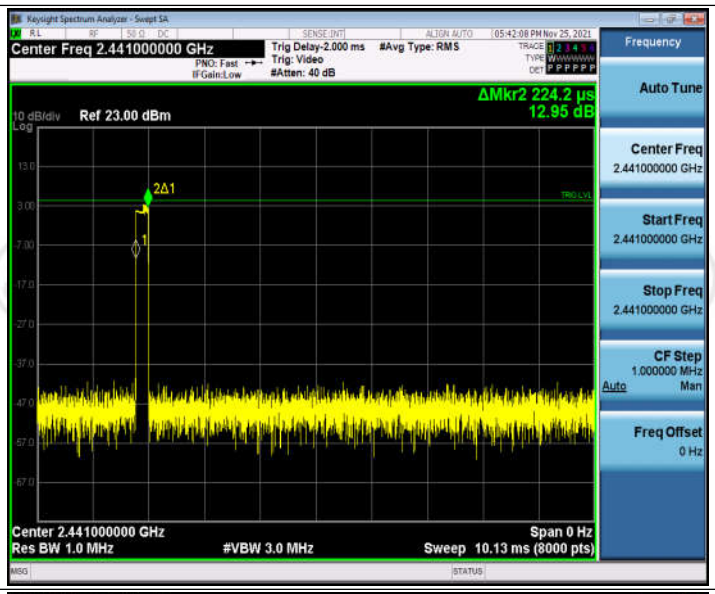


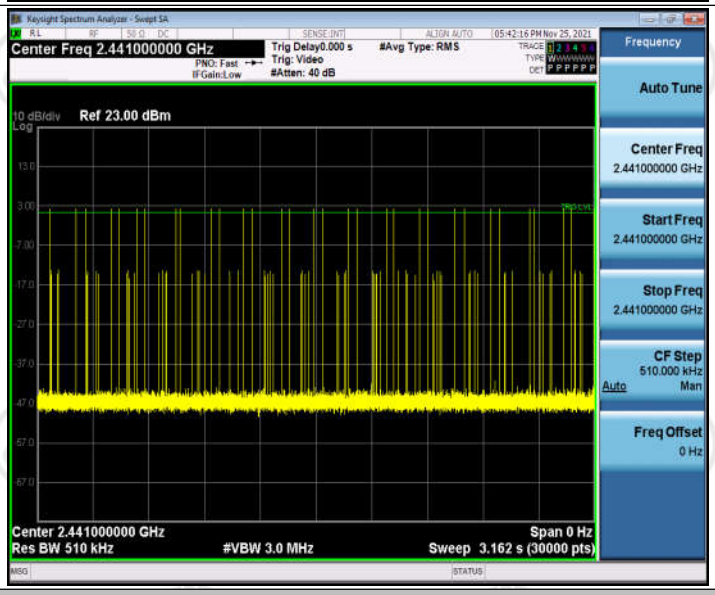
2DH5_Ant1_Hop



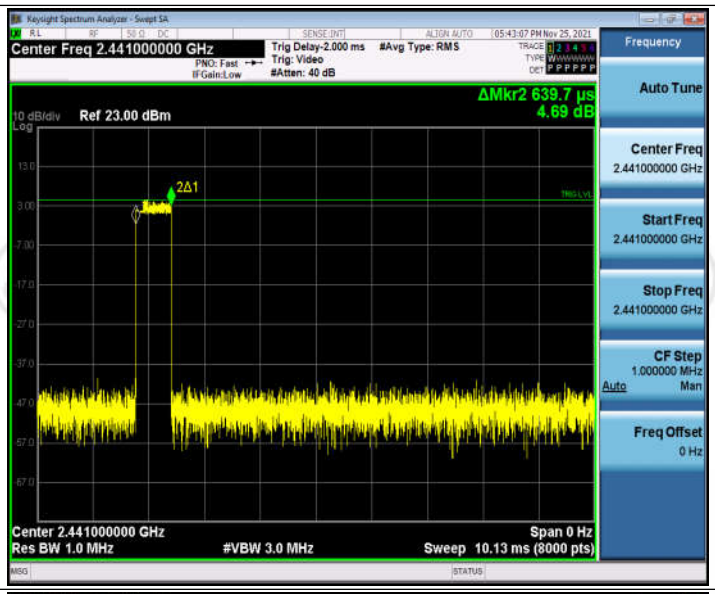


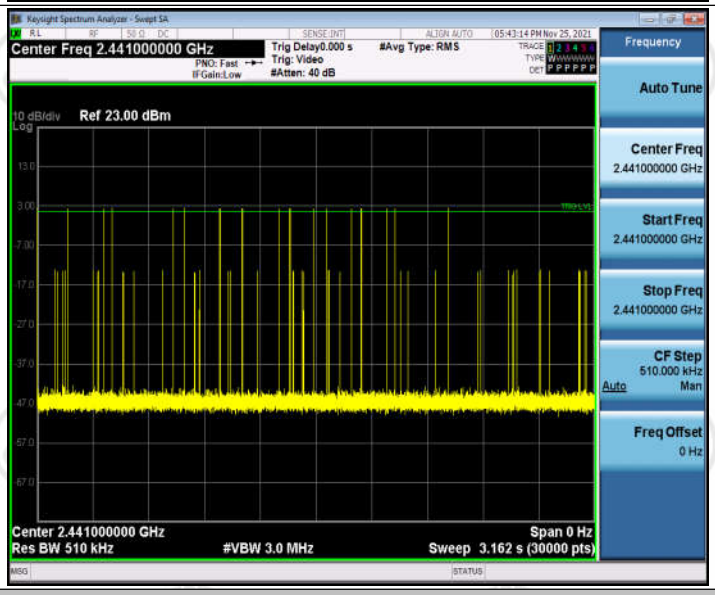
3DH1_Ant1_Hop



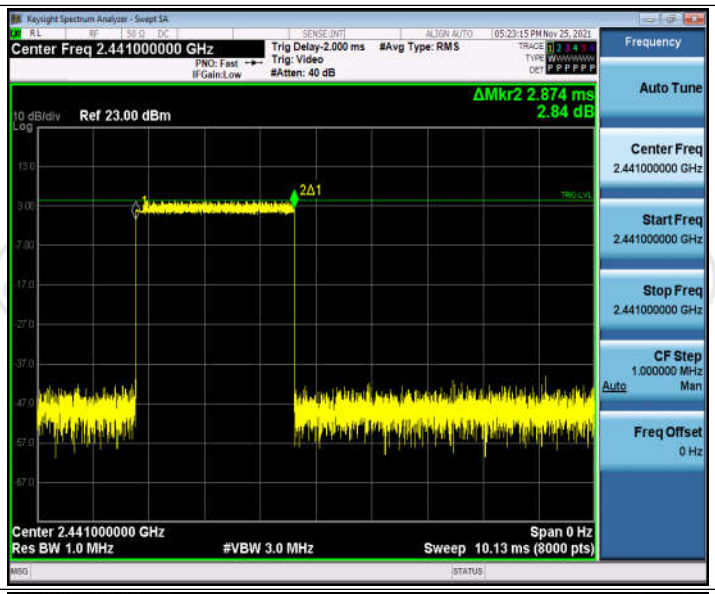


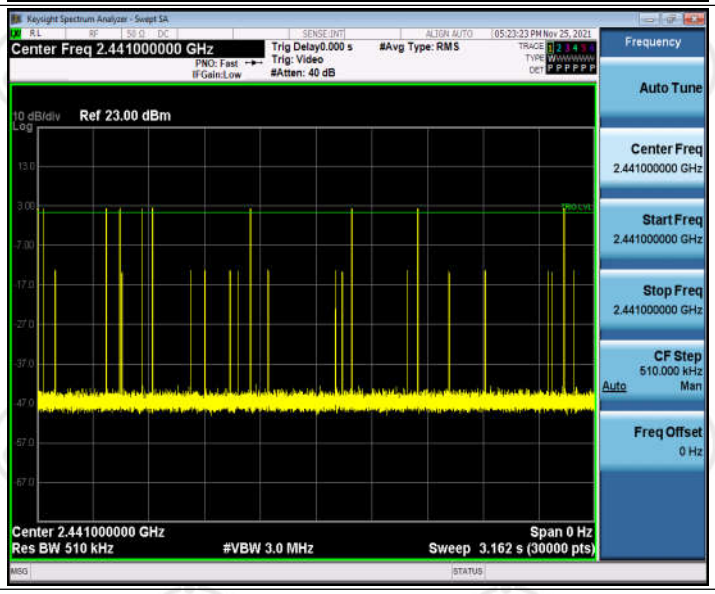
3DH3_Ant1_Hop





3DH5_Ant1_Hop


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.441000000 GHz
Trig Delay-2.000 ms
#Avg Type: RMS
Trig: Video
#Atten: 40 dB
ΔMkr2 2.874 ms
2.84 dB
10 dB/div Ref 23.00 dBm
Center 2.441000000 GHz
Span 0 Hz
Res BW 1.0 MHz
#VBW 3.0 MHz
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
Freq Offset 0 Hz


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.441000000 GHz
Trig Delay0.000 s
#Avg Type: RMS
Trig: Video
#Atten: 40 dB
10 dB/div Ref 23.00 dBm
Center 2.441000000 GHz
Span 0 Hz
Res BW 510 kHz
#VBW 3.0 MHz
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
Freq Offset 0 Hz

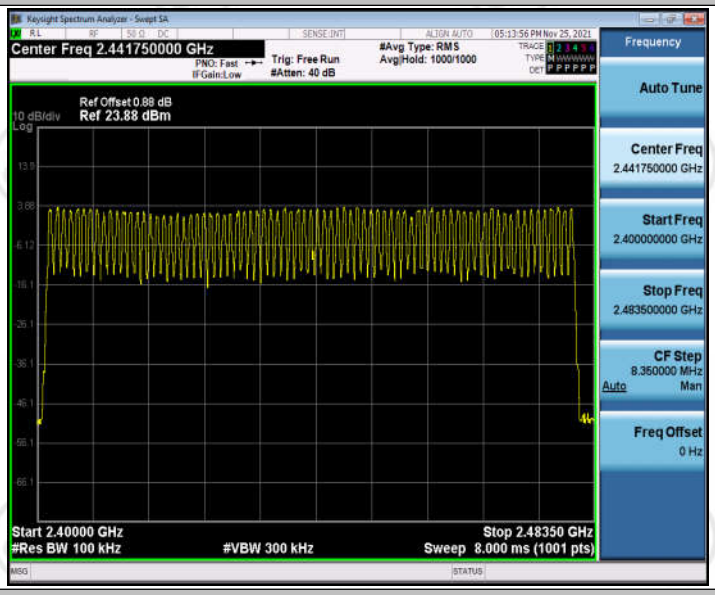
Appendix F: Number of hopping channels

Test Result

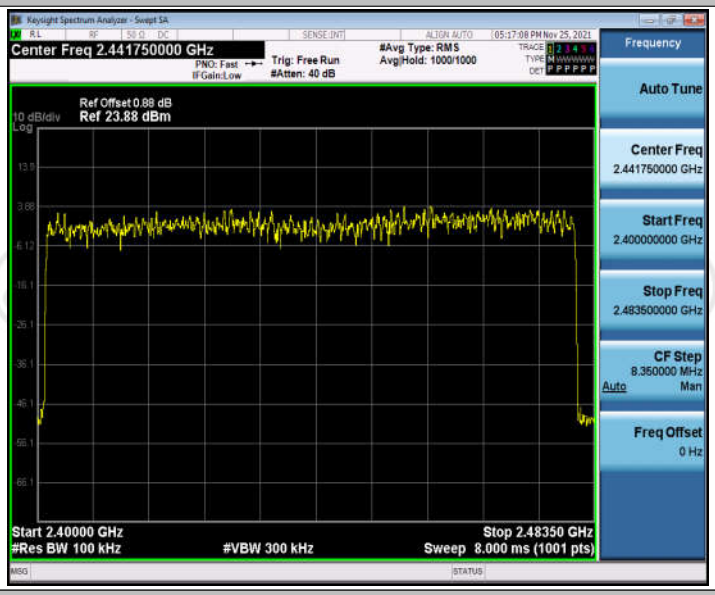
TestMode	Antenna	Channel	Result[Num]	Limit[Num]	Verdict
DH5	Ant1	Hop	79	>=15	PASS
2DH5	Ant1	Hop	79	>=15	PASS
3DH5	Ant1	Hop	79	>=15	PASS

Test Graphs

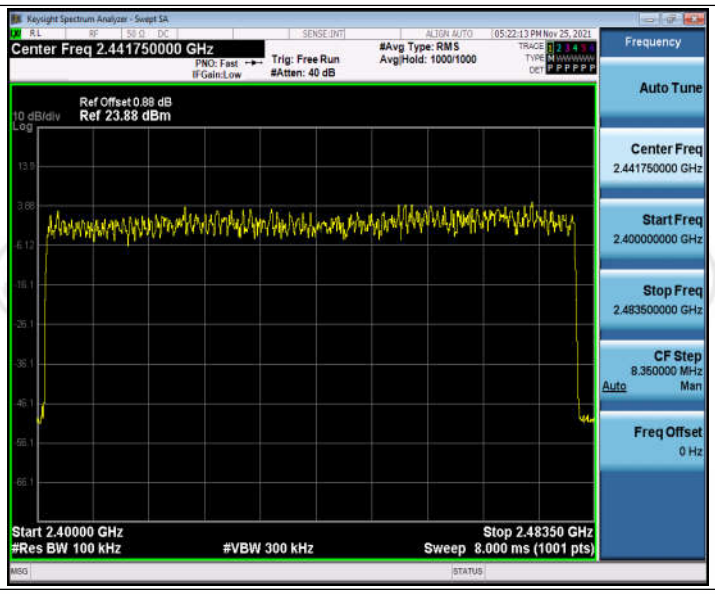
DH5_Ant1_Hop



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
Avg|Hold: 1000/1000
05:22:13 PM Nov 25, 2021
Ref Offset 0.88 dB
10 dB/div
Ref 23.88 dBm
Log
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

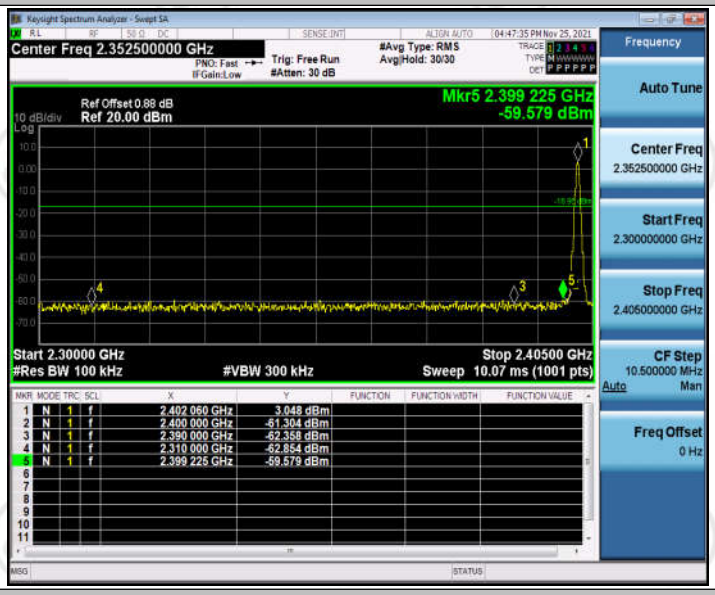
Appendix G: Band edge measurements

Test Result

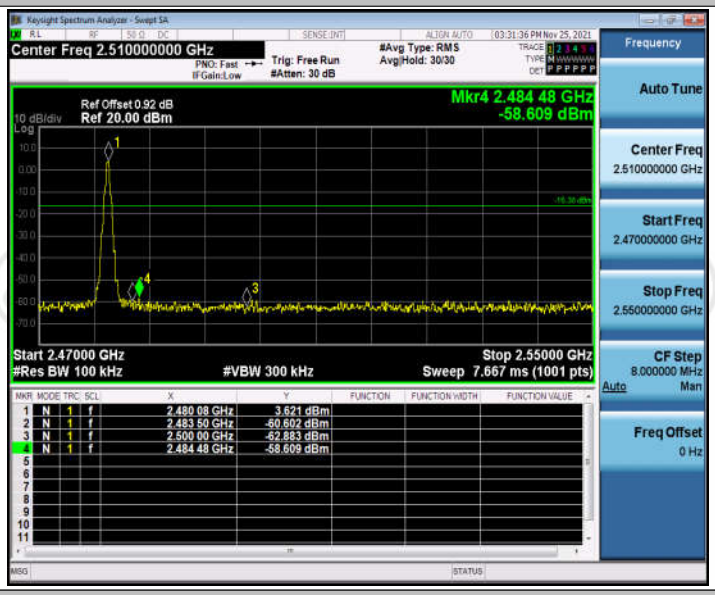
TestMode	Antenna	ChName	Channel	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Low	2402	3.05	-59.58	<=-16.95	PASS
		High	2480	3.62	-58.61	<=-16.38	PASS
		Low	Hop_2402	3.22	-58.62	<=-16.78	PASS
		High	Hop_2480	3.32	-58.26	<=-16.68	PASS
2DH5	Ant1	Low	2402	0.34	-58.54	<=-19.66	PASS
		High	2480	1.00	-59.04	<=-19	PASS
		Low	Hop_2402	0.54	-57.81	<=-19.46	PASS
		High	Hop_2480	3.78	-57.98	<=-16.22	PASS
3DH5	Ant1	Low	2402	0.40	-57.35	<=-19.61	PASS
		High	2480	1.16	-58.71	<=-18.84	PASS
		Low	Hop_2402	1.50	-58.4	<=-18.5	PASS
		High	Hop_2480	4.99	-58.37	<=-15.01	PASS

Test Graphs

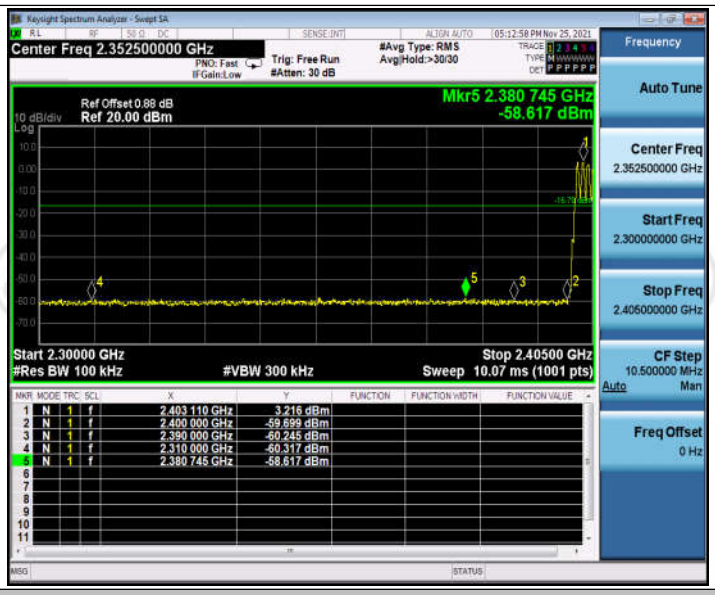
DH5_Ant1_Low_2402



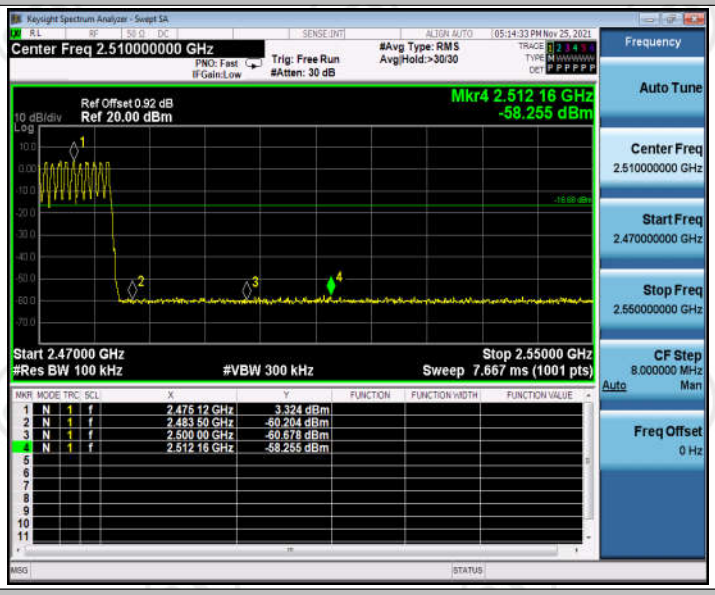
DH5_Ant1_High_2480



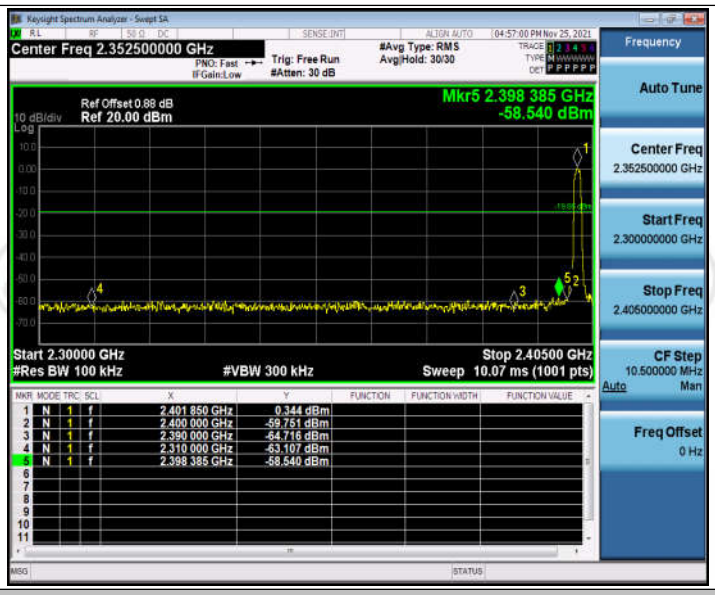
DH5_Ant1_Low_Hop_2402



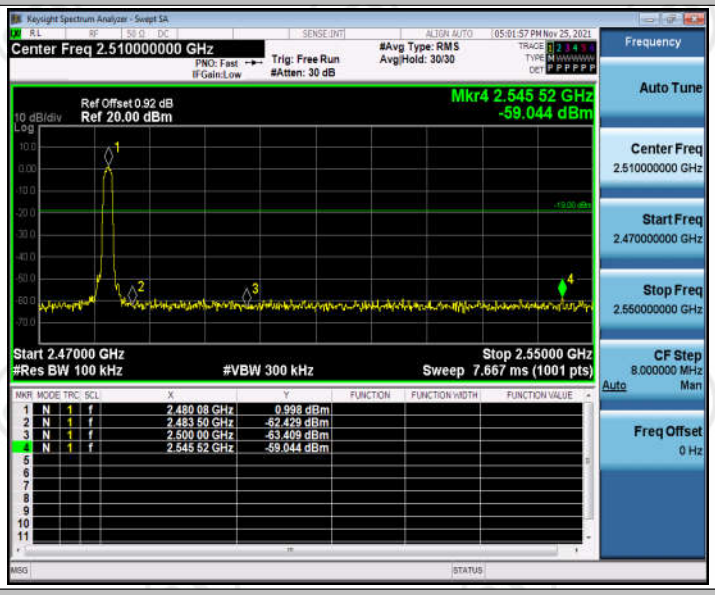
DH5_Ant1_High_Hop_2480



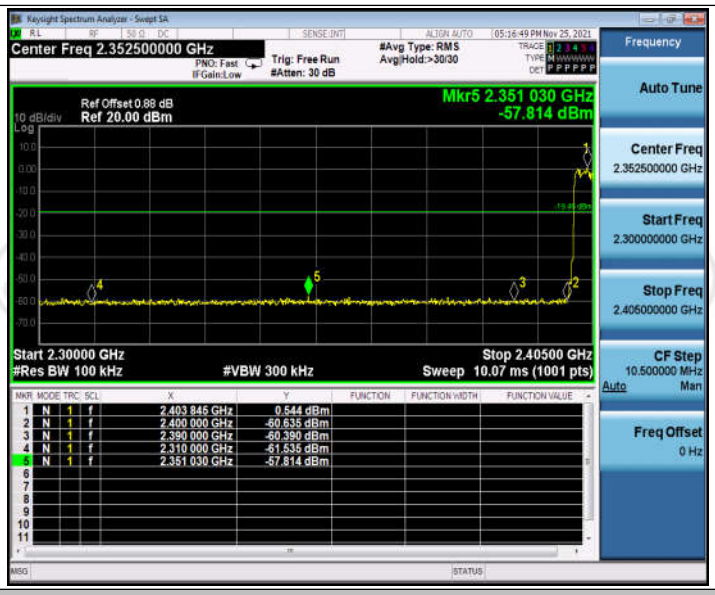
2DH5_Ant1_Low_2402



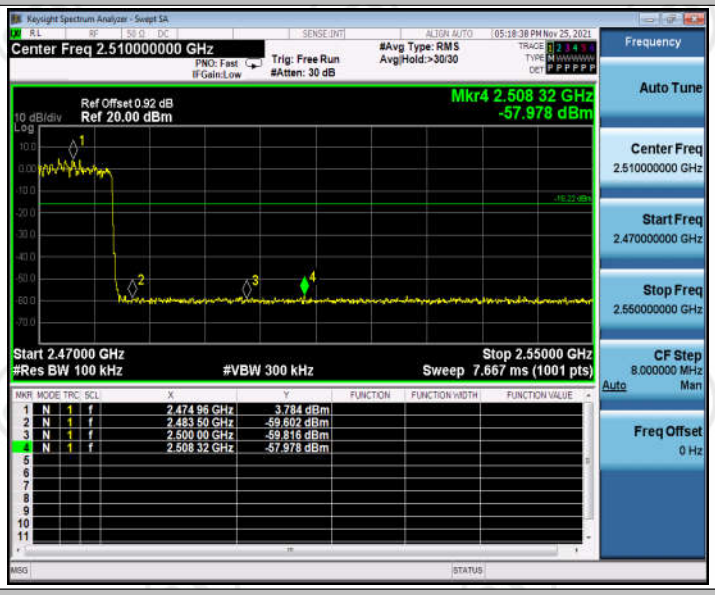
2DH5_Ant1_High_2480



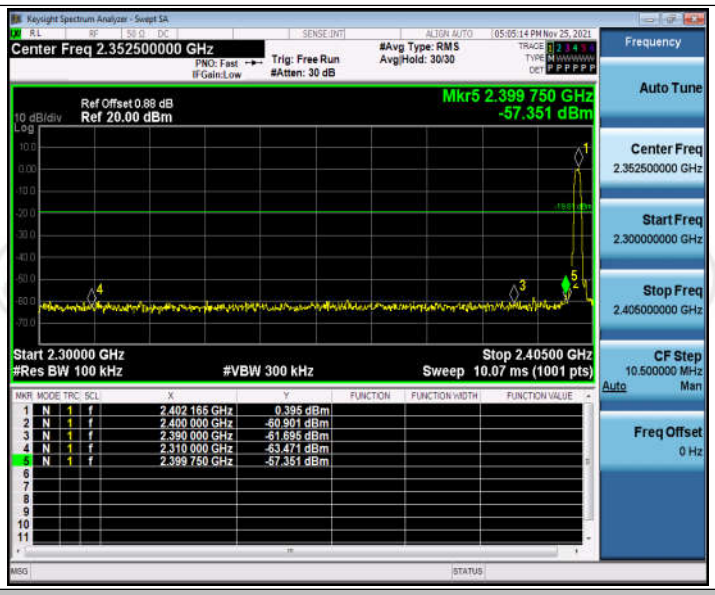
2DH5_Ant1_Low_Hop_2402



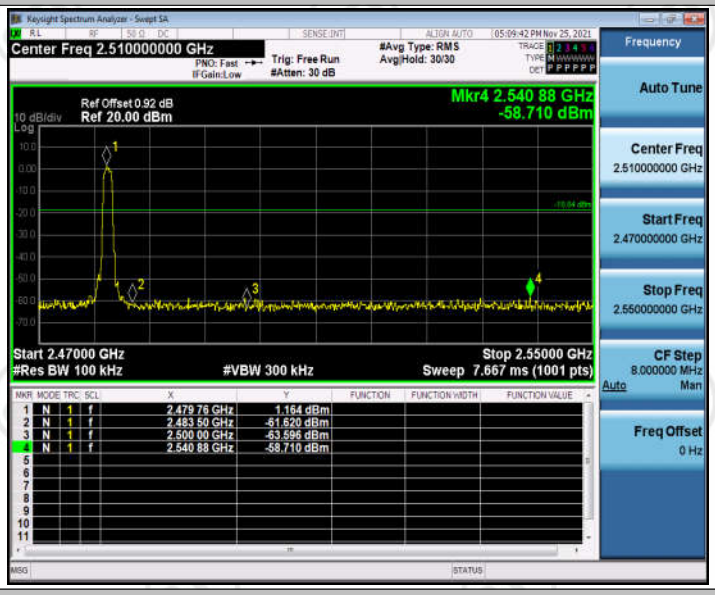
2DH5_Ant1_High_Hop_2480



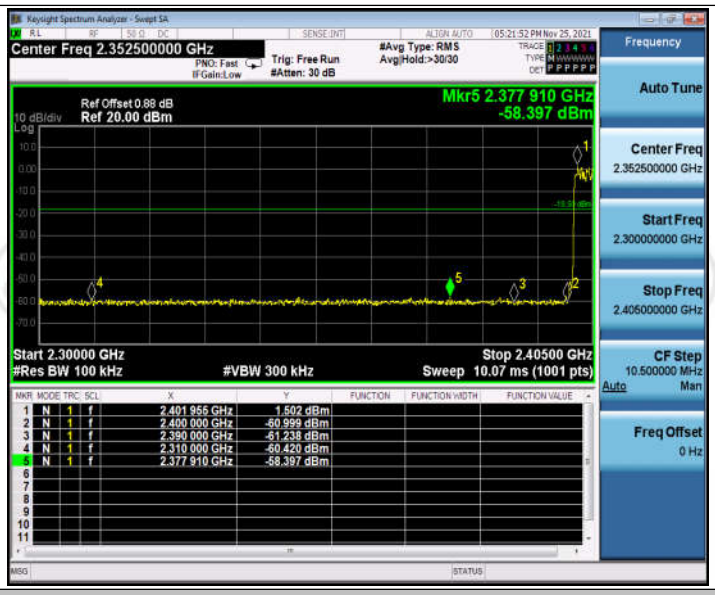
3DH5_Ant1_Low_2402



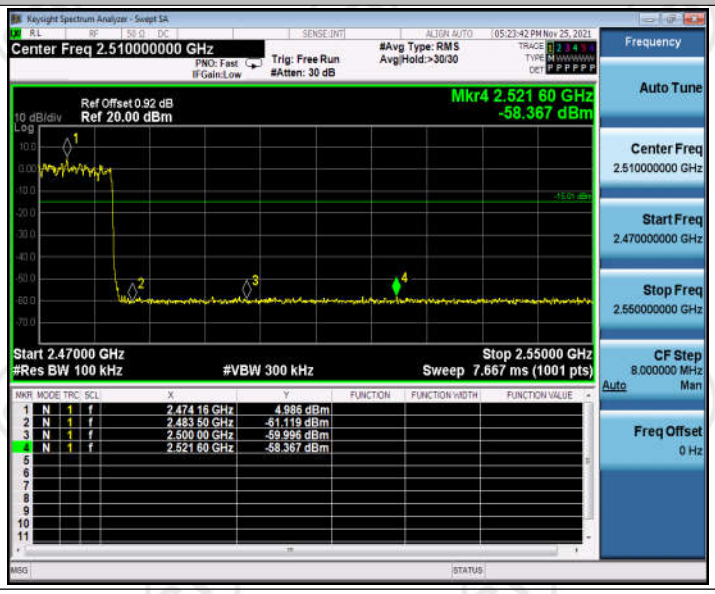
3DH5_Ant1_High_2480



3DH5_Ant1_Low_Hop_2402



3DH5_Ant1_High_Hop_2480



Appendix H: Conducted Spurious Emission

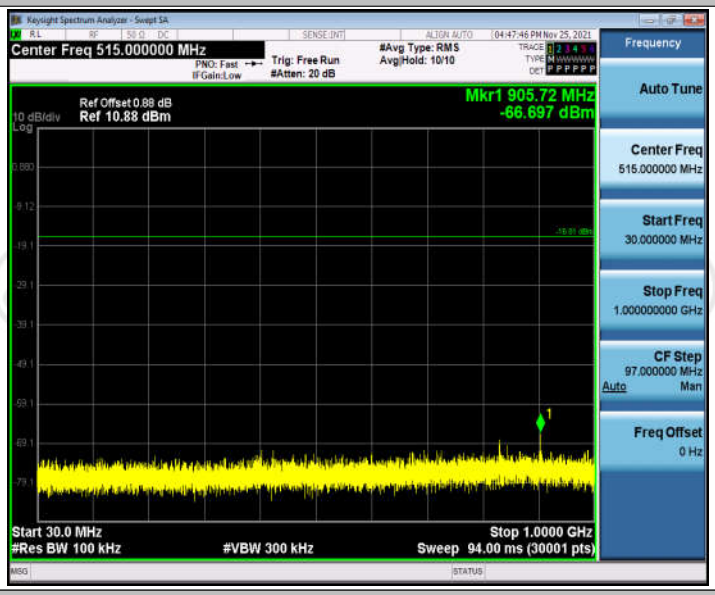
Test Result

TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	2402	Reference	3.20	3.20	---	PASS
			30~1000	30~1000	-66.697	<=-16.805	PASS
			1000~26500	1000~26500	-50.488	<=-16.805	PASS
		2441	Reference	3.67	3.67	---	PASS
			30~1000	30~1000	-55.909	<=-16.332	PASS
			1000~26500	1000~26500	-54.282	<=-16.332	PASS
		2480	Reference	3.25	3.25	---	PASS
			30~1000	30~1000	-68.143	<=-16.75	PASS
			1000~26500	1000~26500	-55.198	<=-16.75	PASS
2DH5	Ant1	2402	Reference	1.92	1.92	---	PASS
			30~1000	30~1000	-70.476	<=-18.081	PASS
			1000~26500	1000~26500	-51.313	<=-18.081	PASS
		2441	Reference	2.48	2.48	---	PASS
			30~1000	30~1000	-66.47	<=-17.525	PASS
			1000~26500	1000~26500	-53.021	<=-17.525	PASS
		2480	Reference	2.22	2.22	---	PASS
			30~1000	30~1000	-64.925	<=-17.777	PASS
			1000~26500	1000~26500	-54.548	<=-17.777	PASS
3DH5	Ant1	2402	Reference	1.87	1.87	---	PASS
			30~1000	30~1000	-70.467	<=-18.126	PASS
			1000~26500	1000~26500	-51.205	<=-18.126	PASS
		2441	Reference	1.86	1.86	---	PASS
			30~1000	30~1000	-70.06	<=-18.137	PASS
			1000~26500	1000~26500	-53.067	<=-18.137	PASS
		2480	Reference	2.26	2.26	---	PASS
			30~1000	30~1000	-63.606	<=-17.737	PASS
			1000~26500	1000~26500	-54.331	<=-17.737	PASS

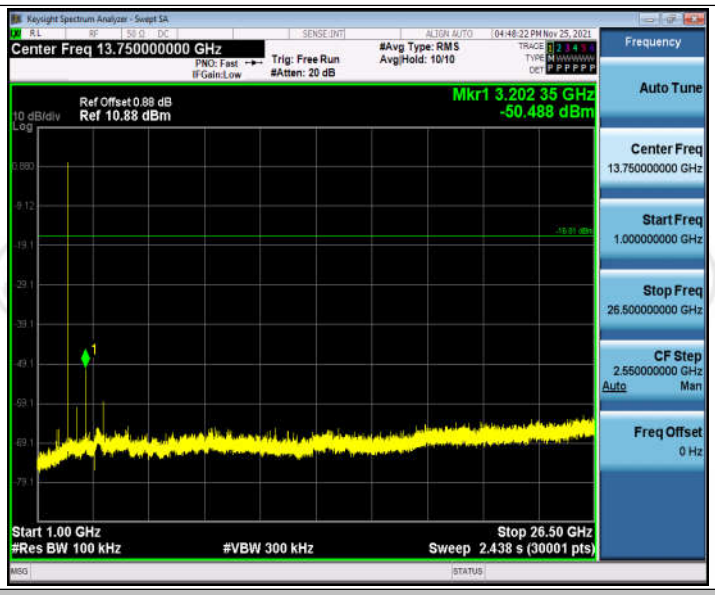
Test Graphs

DH5_Ant1_2402_0~Reference

DH5_Ant1_2402_30~1000

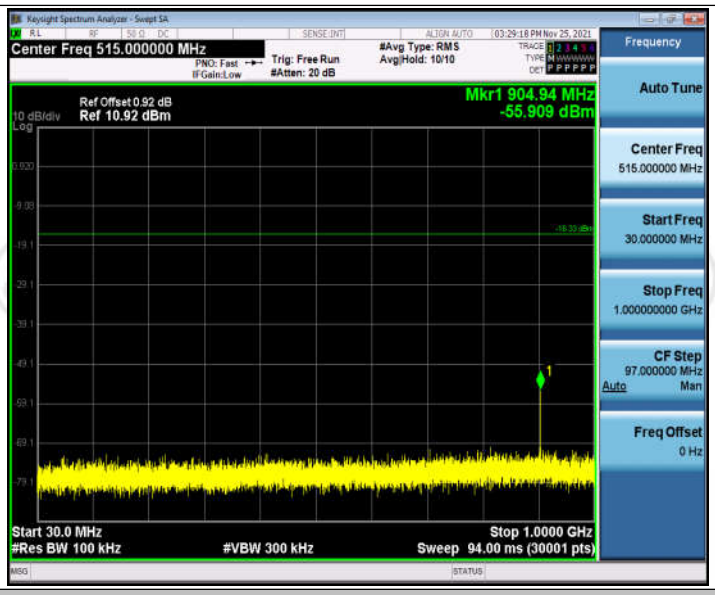


DH5_Ant1_2402_1000~26500

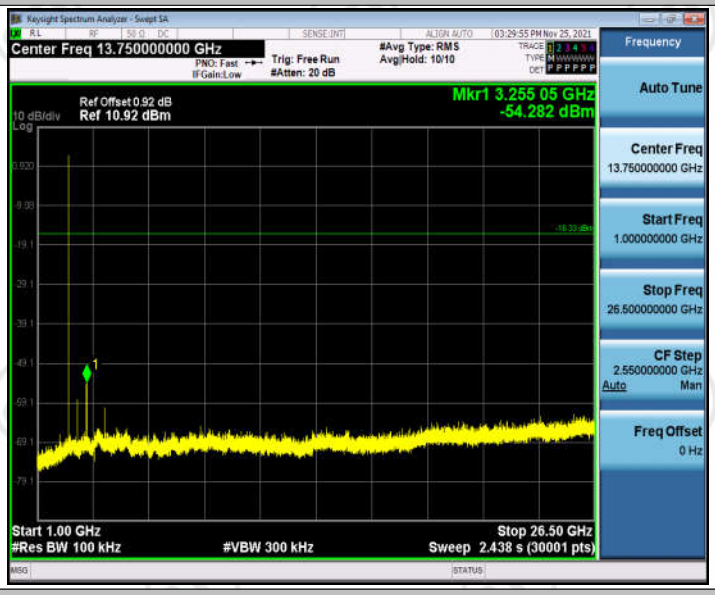


DH5_Ant1_2441_0~Reference

DH5_Ant1_2441_30~1000

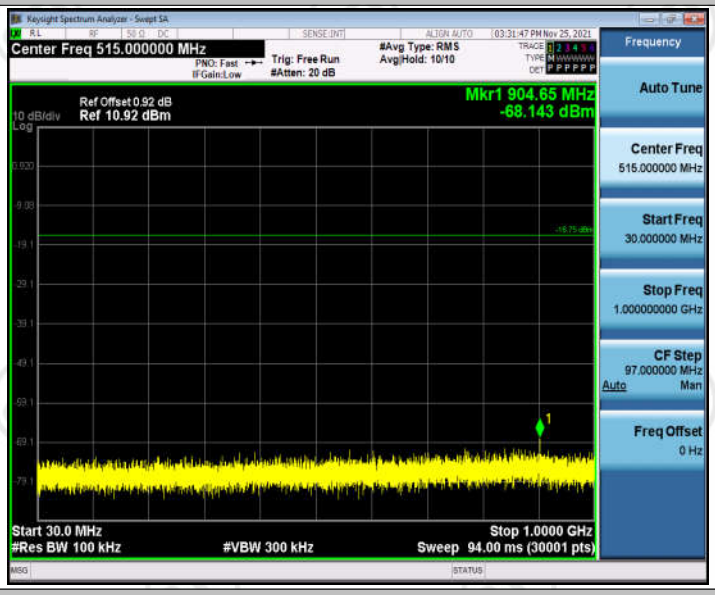


DH5_Ant1_2441_1000~26500

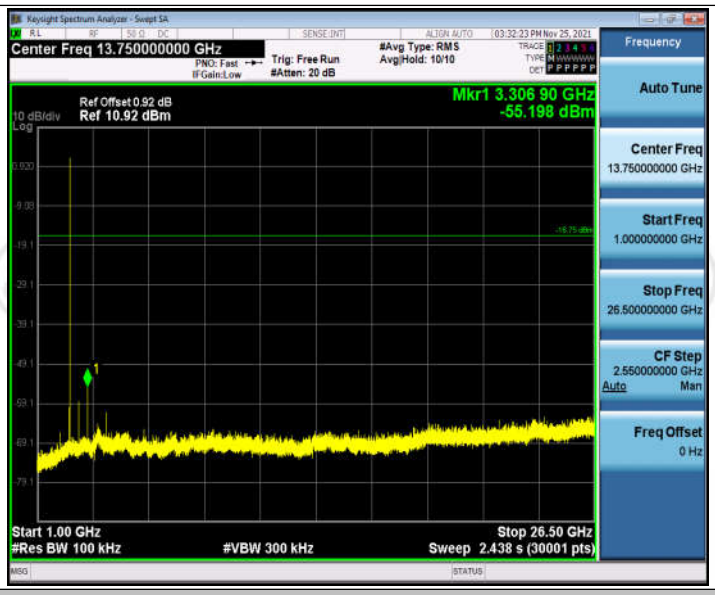


DH5_Ant1_2480_0~Reference

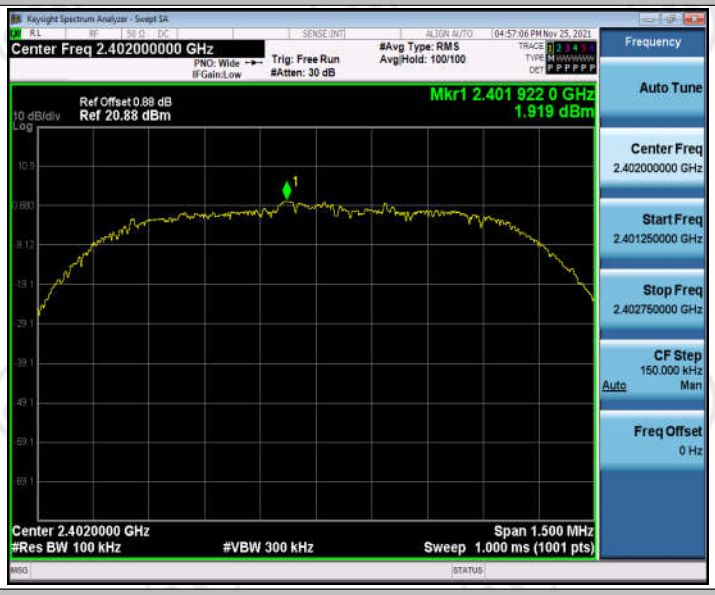
DH5_Ant1_2480_30~1000



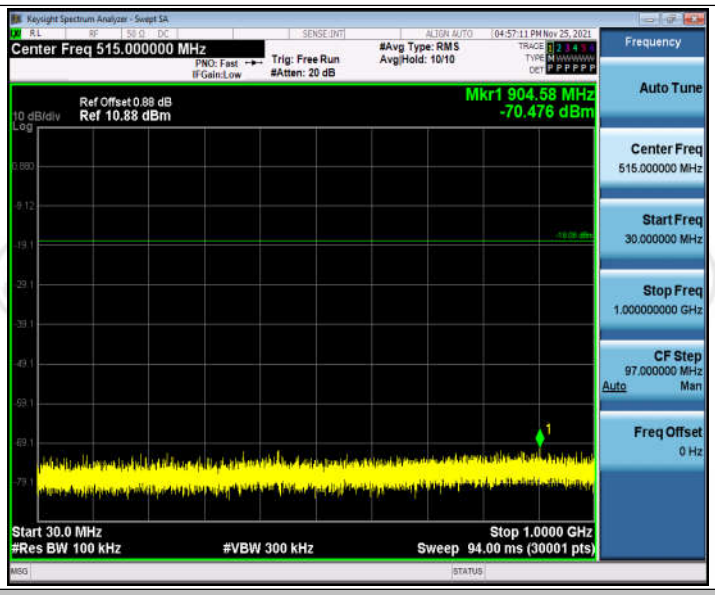
DH5_Ant1_2480_1000~26500



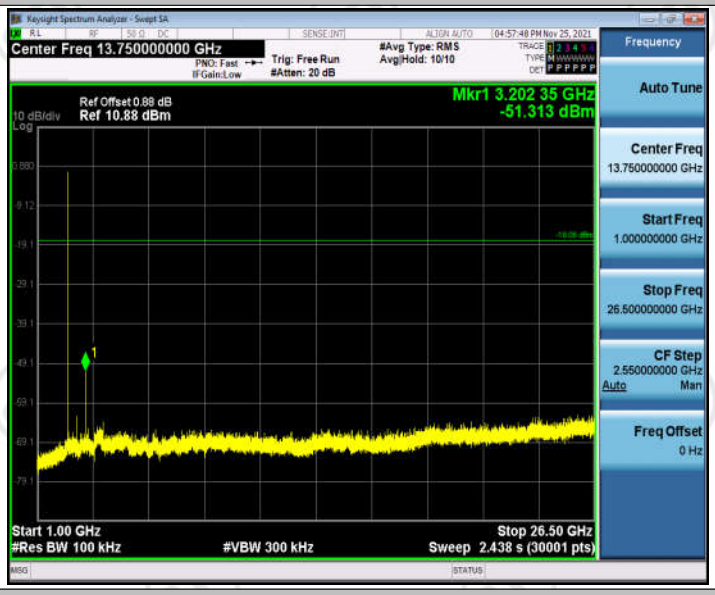
2DH5_Ant1_2402_0~Reference



2DH5_Ant1_2402_30~1000

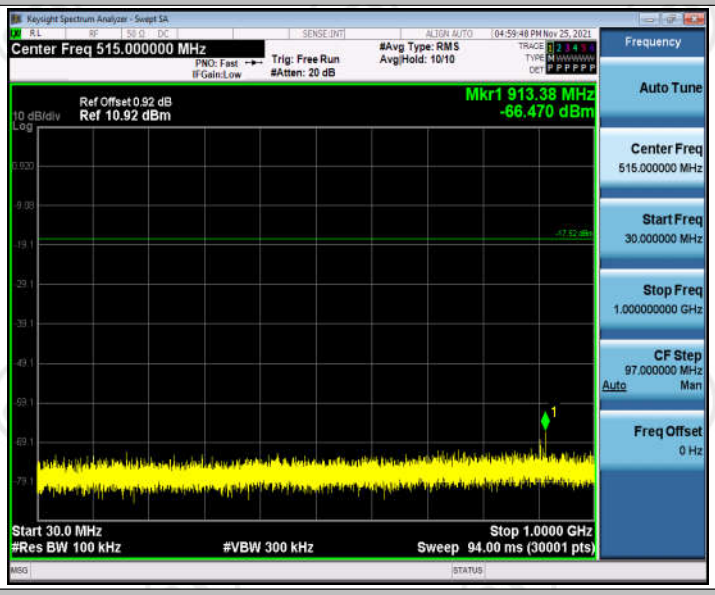


2DH5_Ant1_2402_1000~26500

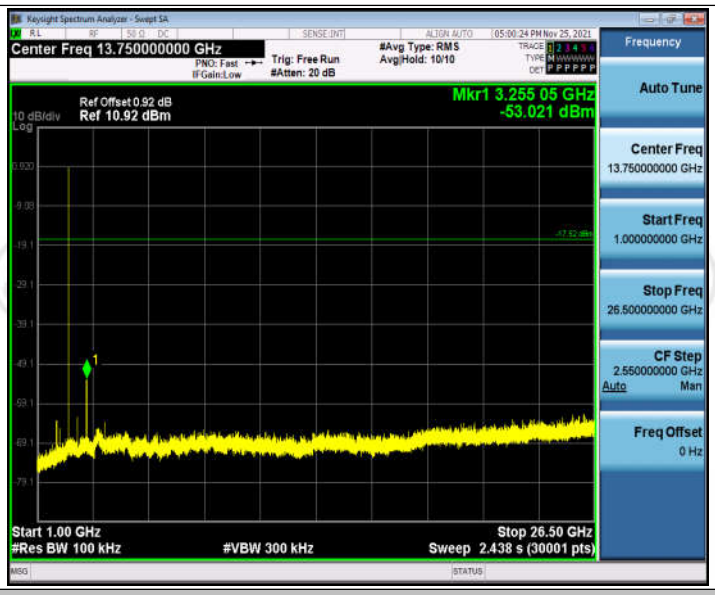


2DH5_Ant1_2441_0~Reference

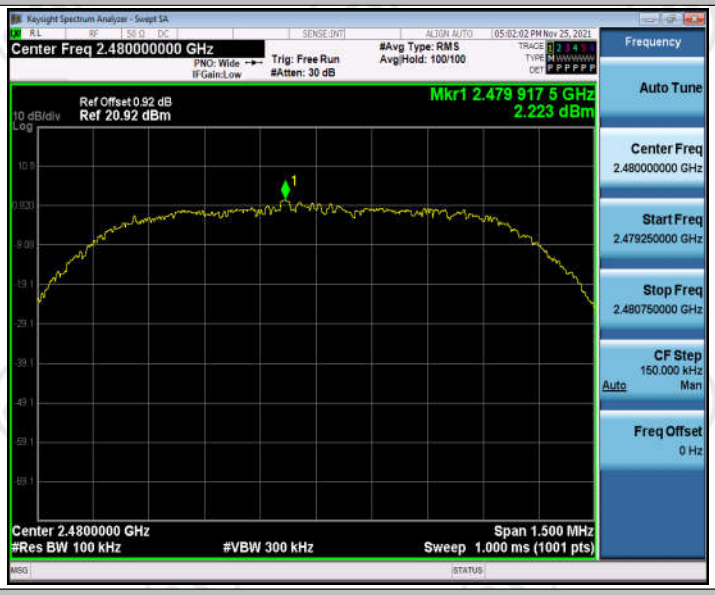
2DH5_Ant1_2441_30~1000



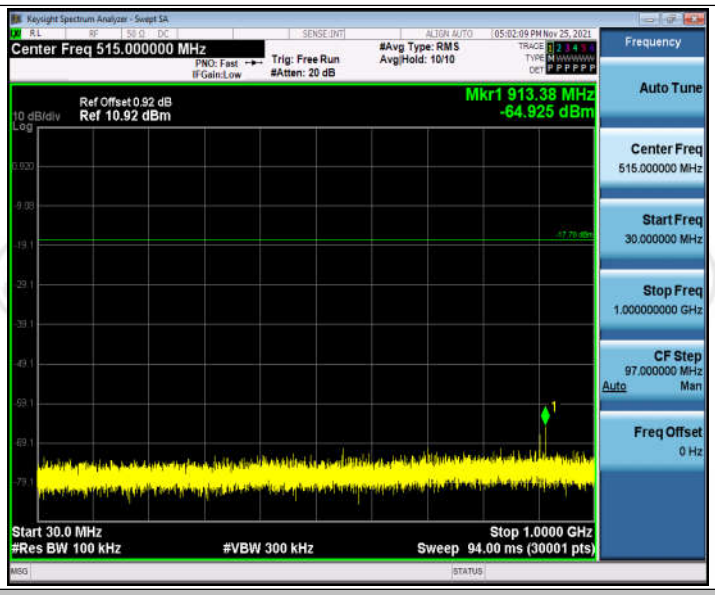
2DH5_Ant1_2441_1000~26500



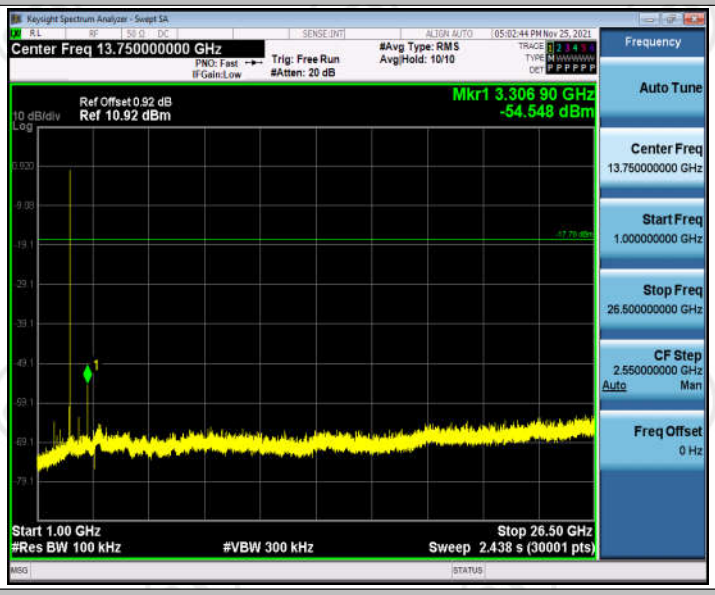
2DH5_Ant1_2480_0~Reference



2DH5_Ant1_2480_30~1000

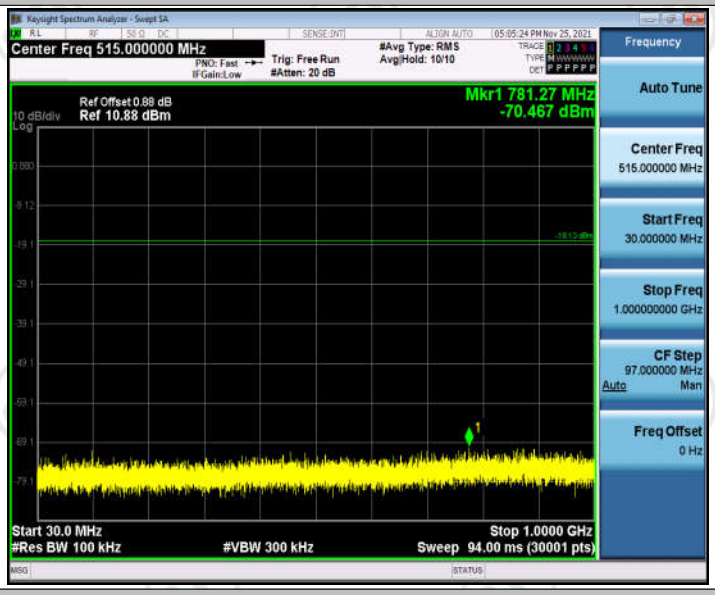


2DH5_Ant1_2480_1000~26500

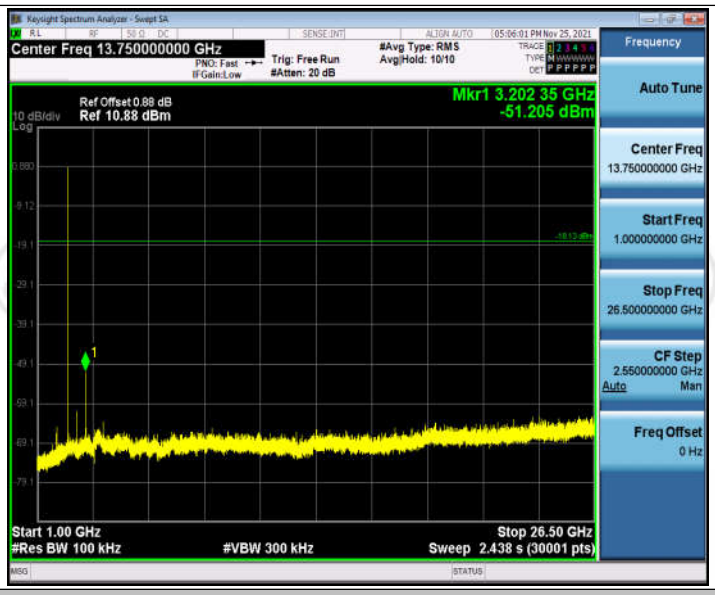


3DH5_Ant1_2402_0~Reference

3DH5_Ant1_2402_30~1000

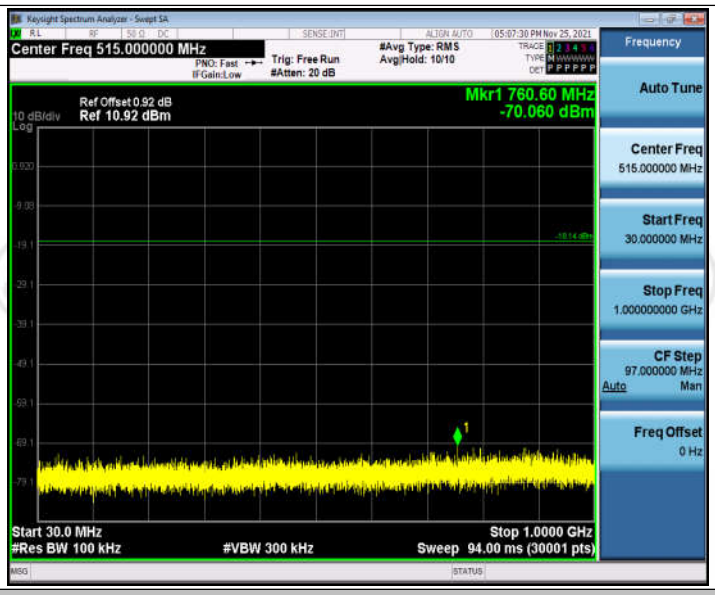


3DH5_Ant1_2402_1000~26500

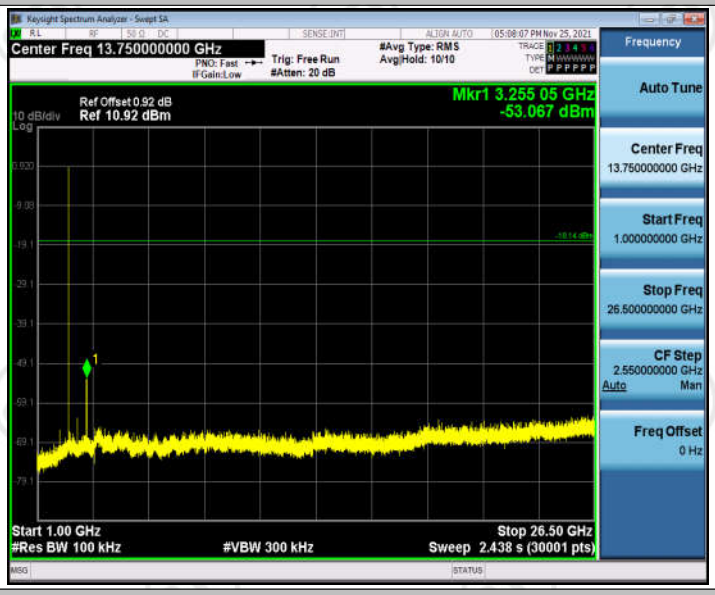


3DH5_Ant1_2441_0~Reference

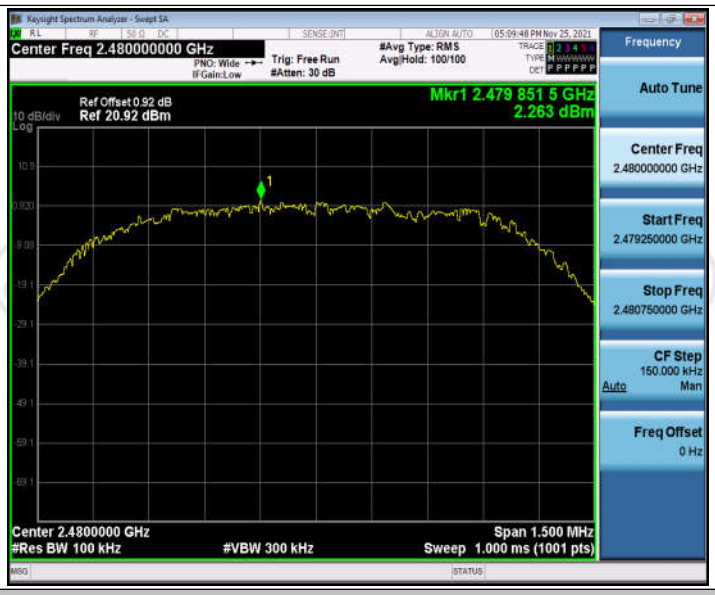
3DH5_Ant1_2441_30~1000



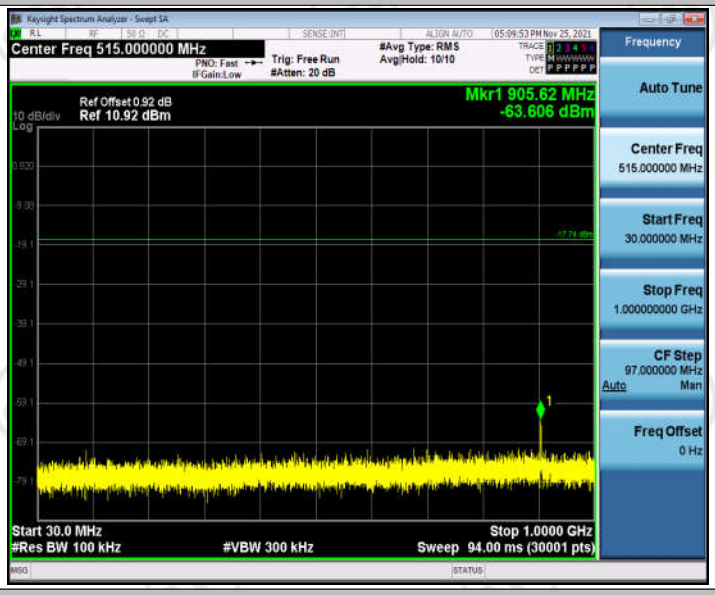
3DH5_Ant1_2441_1000~26500



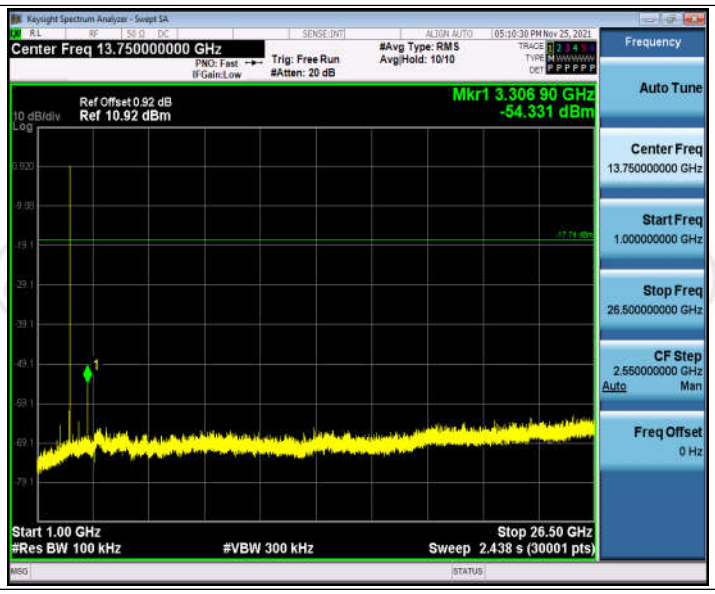
3DH5_Ant1_2480_0~Reference



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
Avg|Hold: 10/10
05:10:30 PM Nov 25, 2021
Ref Offset 0.92 dB
10 dB/div
Ref 10.92 dBm
Log
Mkr1 3.306 90 GHz
-54.331 dBm
Start 1.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep 2.438 s (30001 pts)
Frequency
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

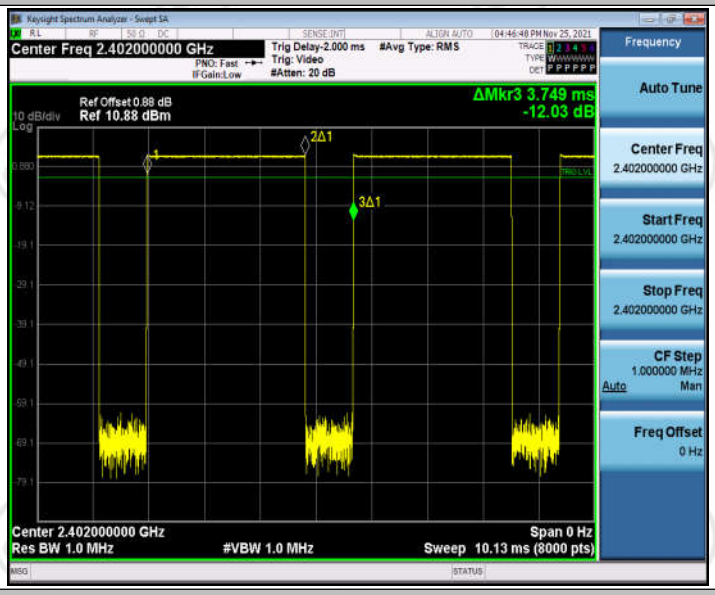
Appendix I: Duty Cycle

Test Result

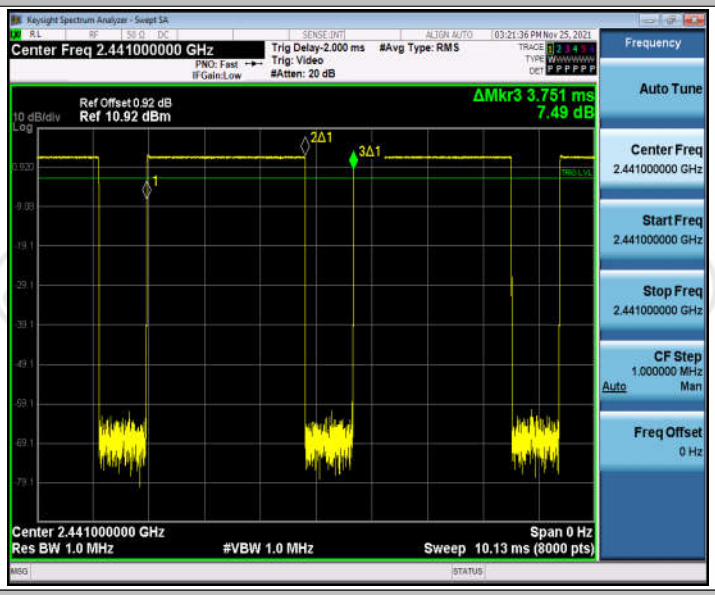
TestMode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	Limit	Verdict
DH5	Ant1	2402	2.87	3.75	76.55	---	PASS
		2441	2.87	3.75	76.56	---	PASS
		2480	2.87	3.75	76.56	---	PASS
2DH5	Ant1	2402	2.87	3.75	76.62	---	PASS
		2441	2.87	3.75	76.63	---	PASS
		2480	2.87	3.75	76.62	---	PASS
3DH5	Ant1	2402	2.88	3.75	76.69	---	PASS
		2441	2.88	3.75	76.66	---	PASS
		2480	2.88	3.75	76.66	---	PASS

Test Graphs

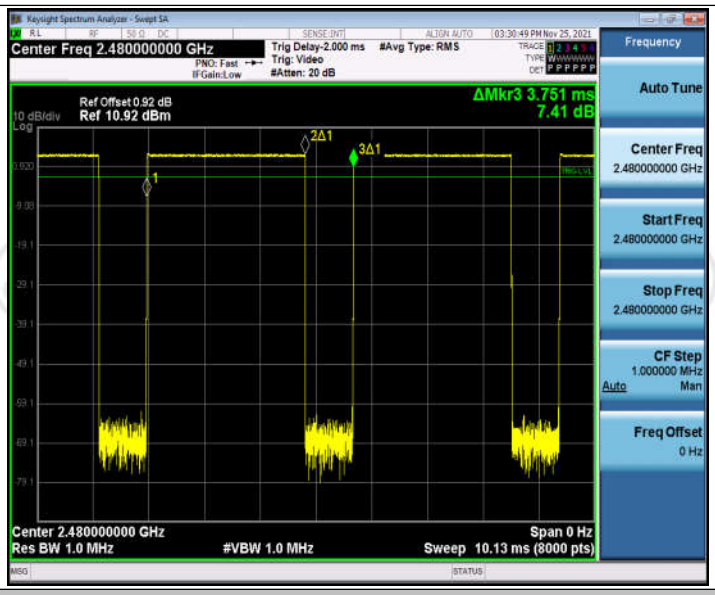
DH5_Ant1_2402



DH5_Ant1_2441



DH5_Ant1_2480



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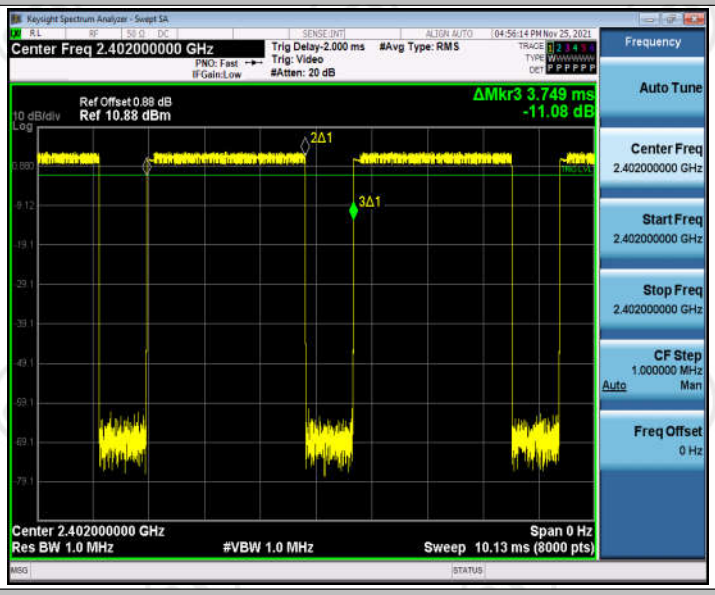

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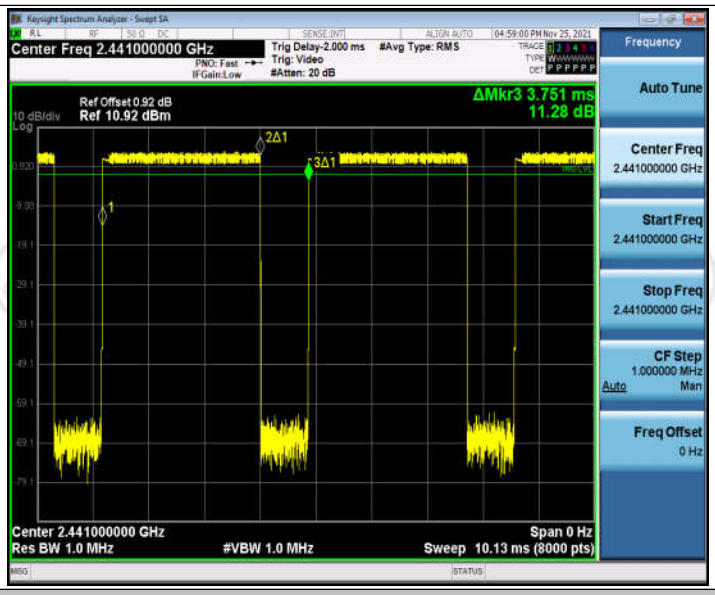

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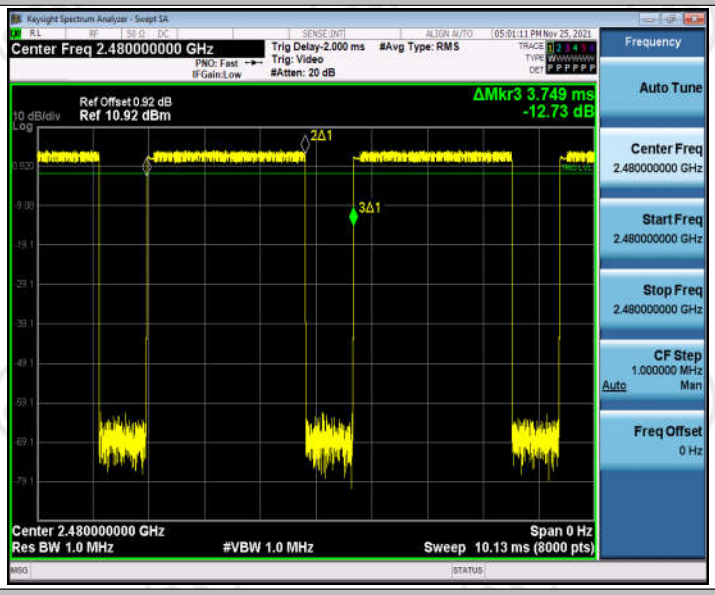

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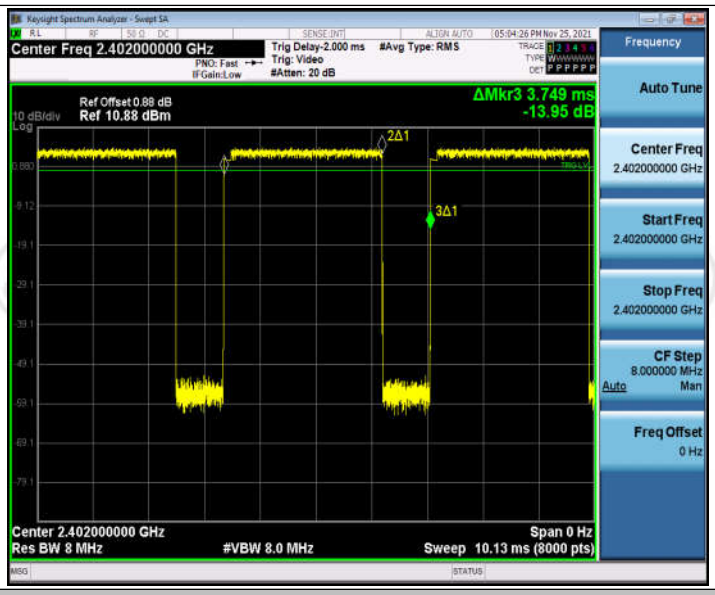

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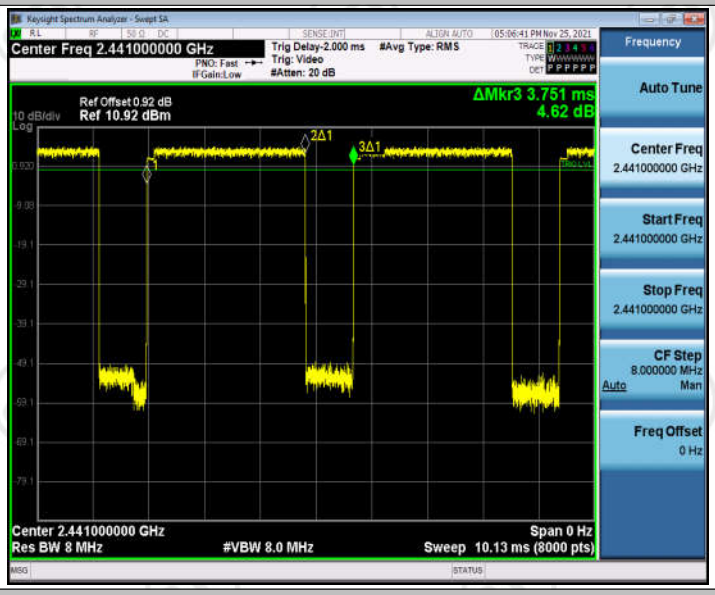

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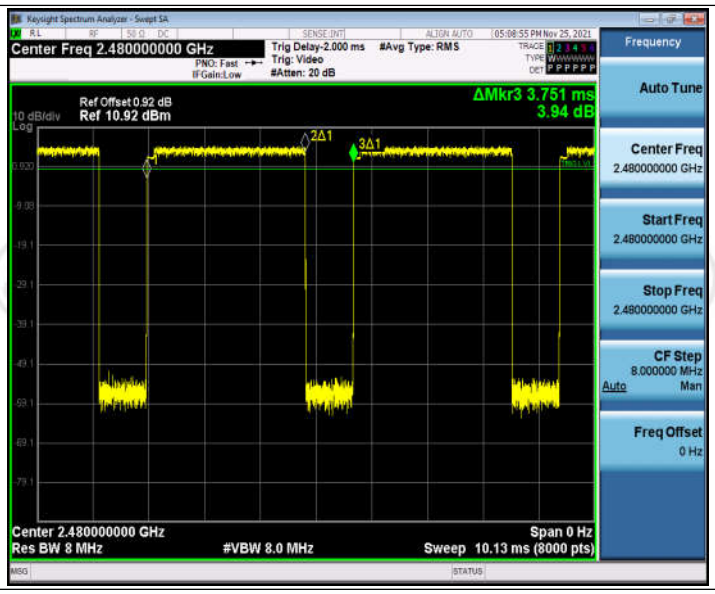

*** End of Report ***