Appendix A

RF Test Data for BT V5.2 (DSS) (Conducted Measurement)

Product Name: TWS Headphones

Trade Mark: LIBMING

Test Model: E02

Environmental Conditions

Temperature:	23.5 ° C
Relative Humidity:	52.2%
ATM Pressure:	100.0 kPa
Test Engineer:	Wunder Wu
Supervised by:	Li Huan

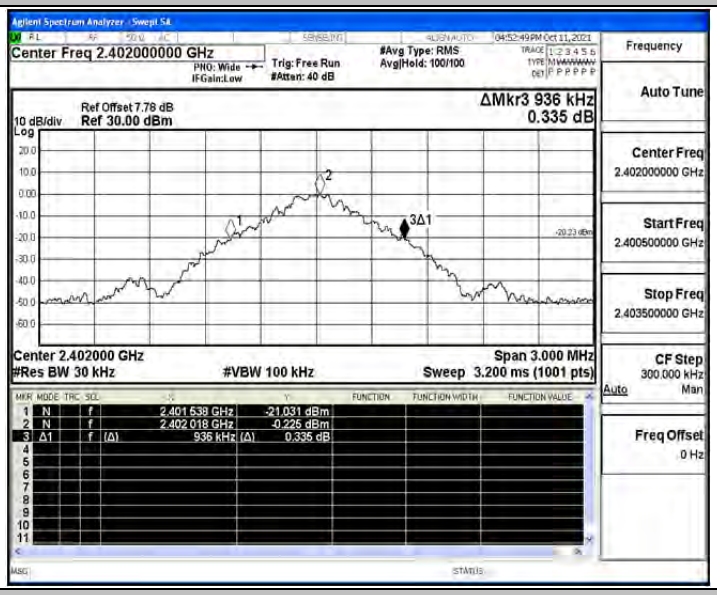
A.1 20dB Emission Bandwidth

Test Result

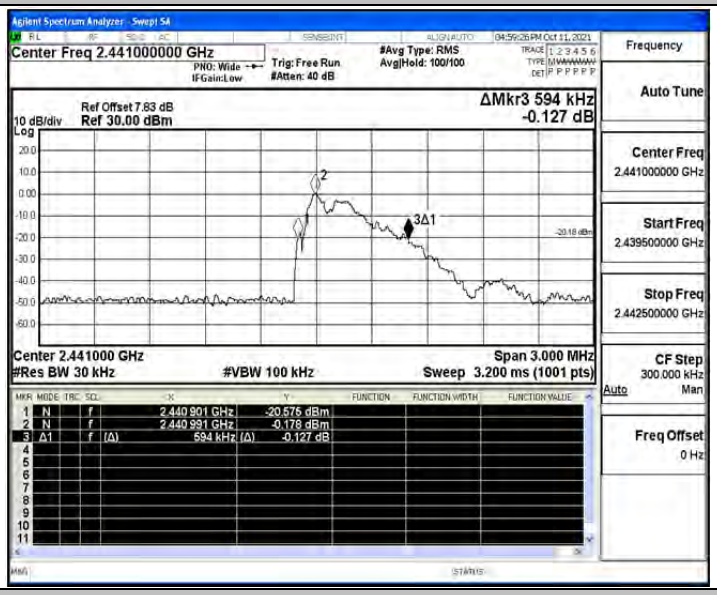
TestMode	Antenna	Channel	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.936	2401.538	2402.474	---	PASS
		2441	0.594	2440.901	2441.495	---	PASS
		2480	0.951	2479.541	2480.492	---	PASS
2DH5	Ant1	2402	1.311	2401.343	2402.654	---	PASS
		2441	1.359	2440.304	2441.663	---	PASS
		2480	1.284	2479.370	2480.654	---	PASS
3DH5	Ant1	2402	1.374	2401.310	2402.684	---	PASS
		2441	1.374	2440.322	2441.696	---	PASS
		2480	1.281	2479.367	2480.648	---	PASS

Test Graphs

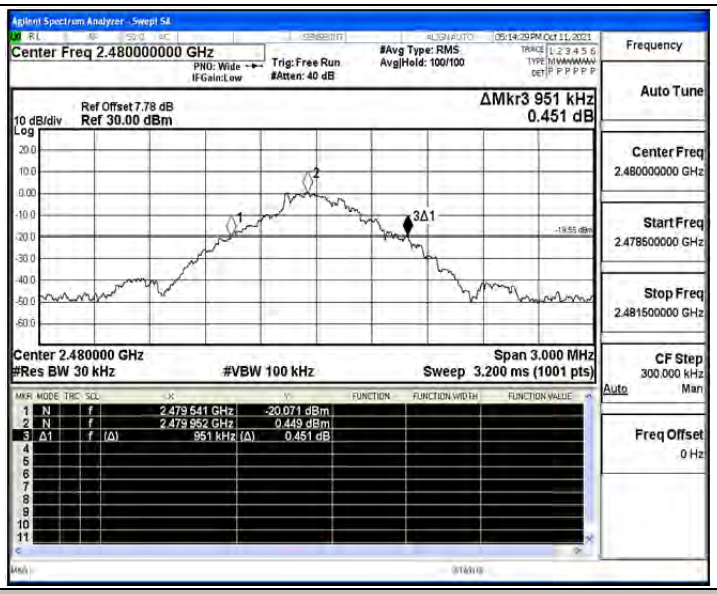
DH5_Ant1_2402



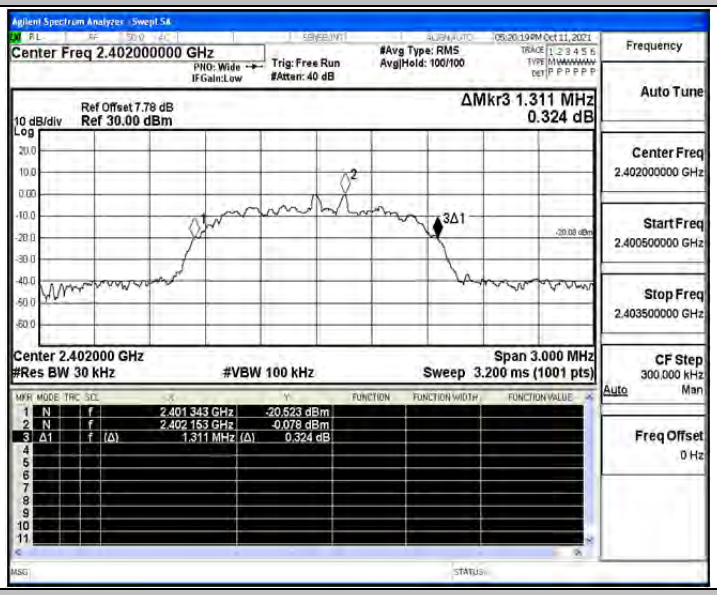
DH5_Ant1_2441



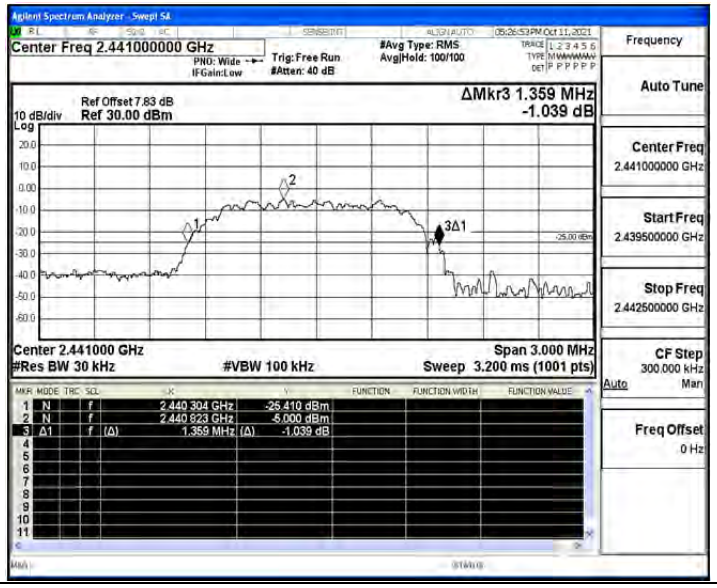
DH5_Ant1_2480



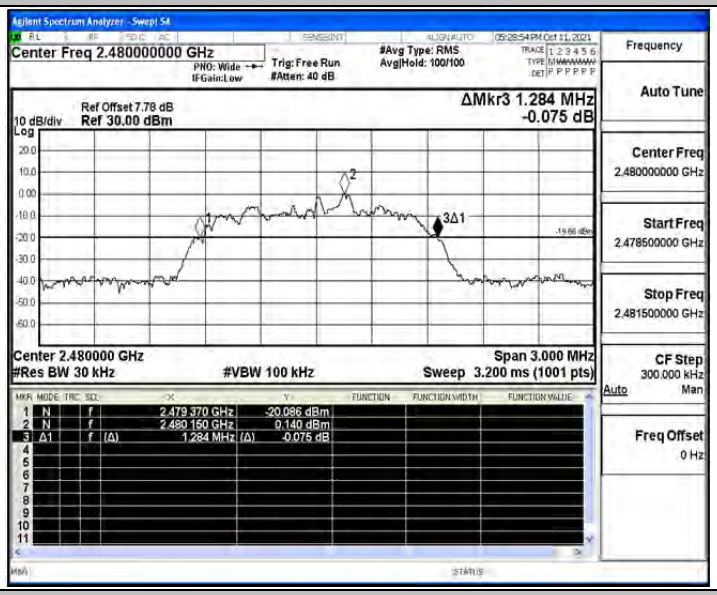
2DH5_Ant1_2402



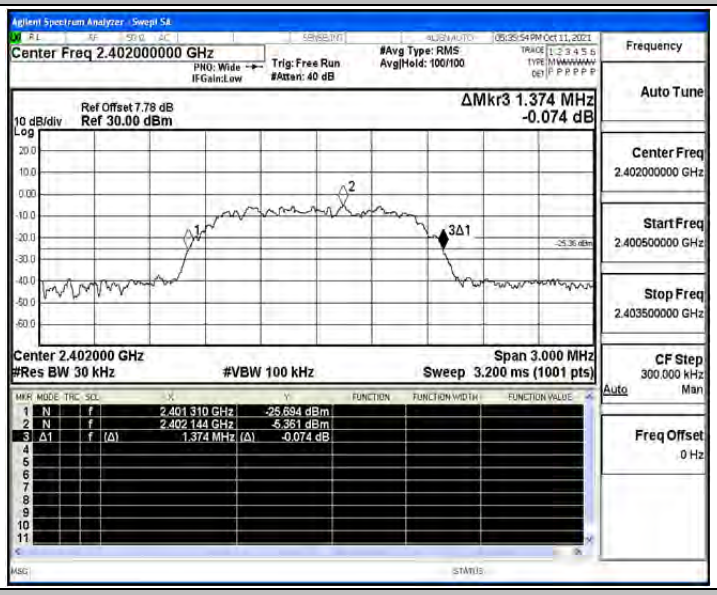
2DH5_Ant1_2441



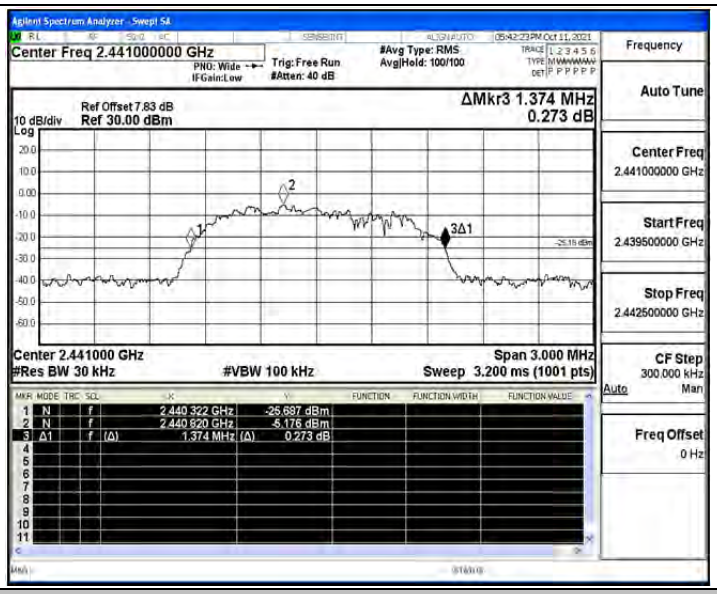
2DH5_Ant1_2480



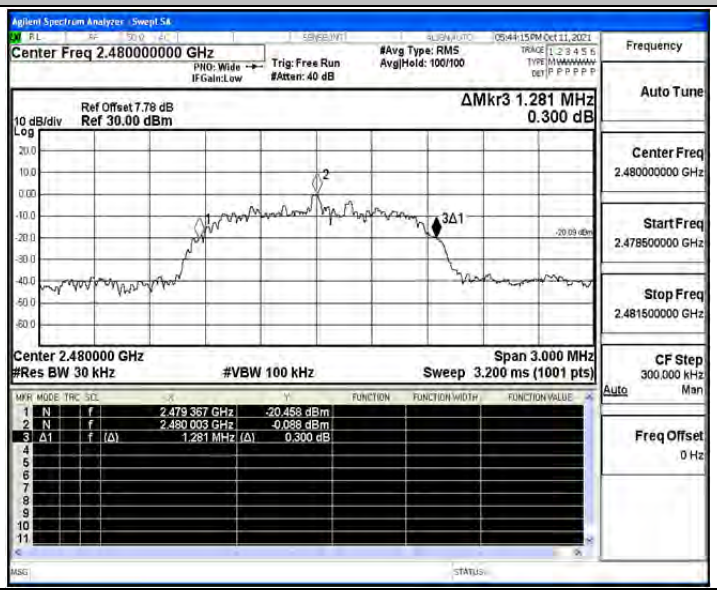
3DH5_Ant1_2402



3DH5_Ant1_2441



3DH5_Ant1_2480



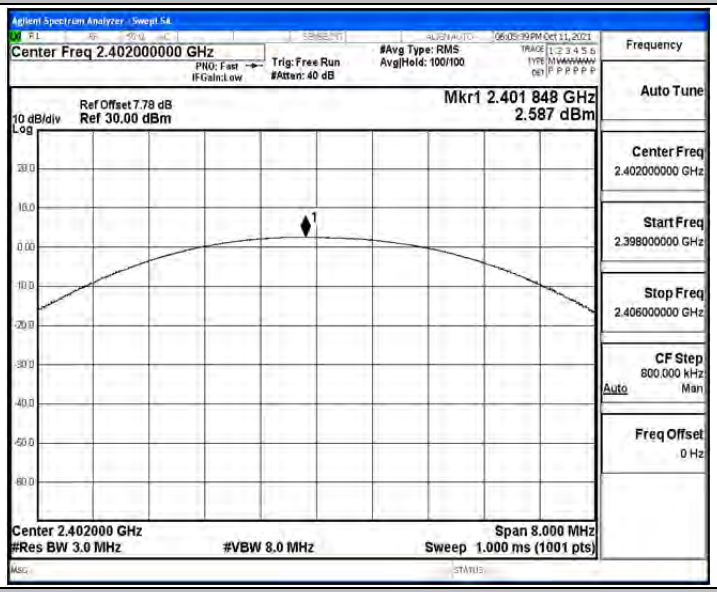
A.2 Maximum peak conducted output power

Test Result

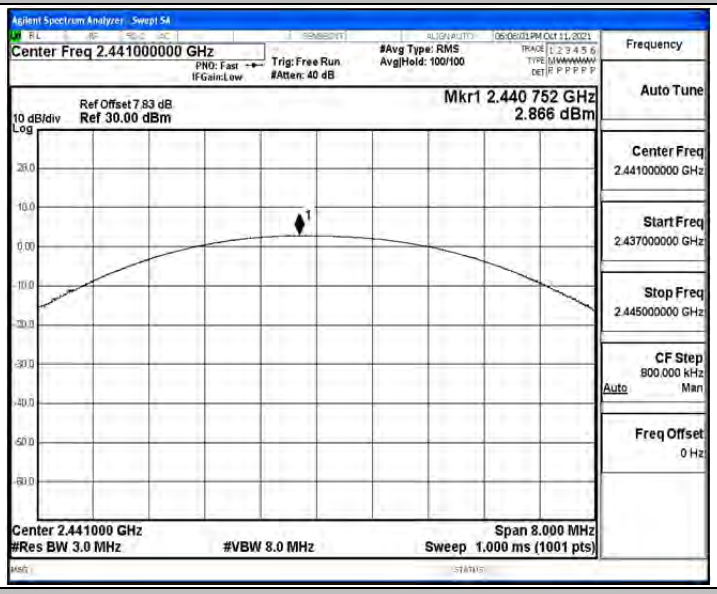
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	2402	2.59	≤20.97	PASS
		2441	2.87	≤20.97	PASS
		2480	2.93	≤20.97	PASS
2DH5	Ant1	2402	3.28	≤20.97	PASS
		2441	3.57	≤20.97	PASS
		2480	3.59	≤20.97	PASS
3DH5	Ant1	2402	3.25	≤20.97	PASS
		2441	3.47	≤20.97	PASS
		2480	3.55	≤20.97	PASS

Test Graphs

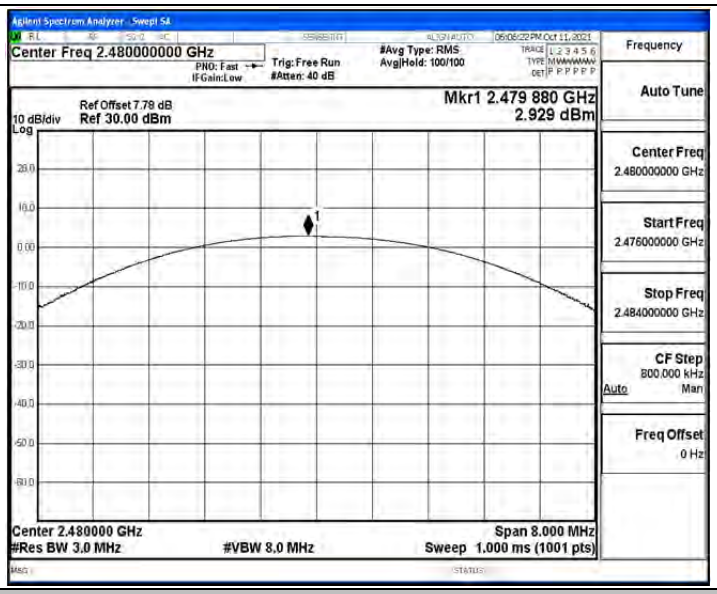
DH5_Ant1_2402



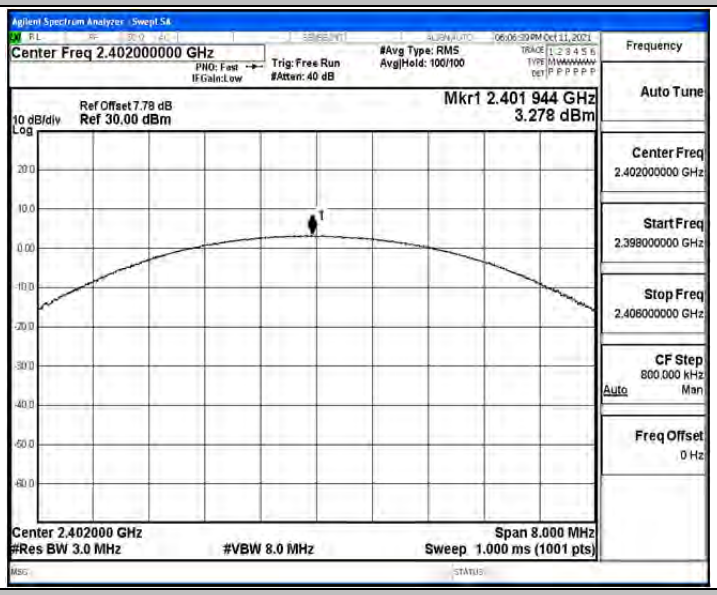
DH5_Ant1_2441



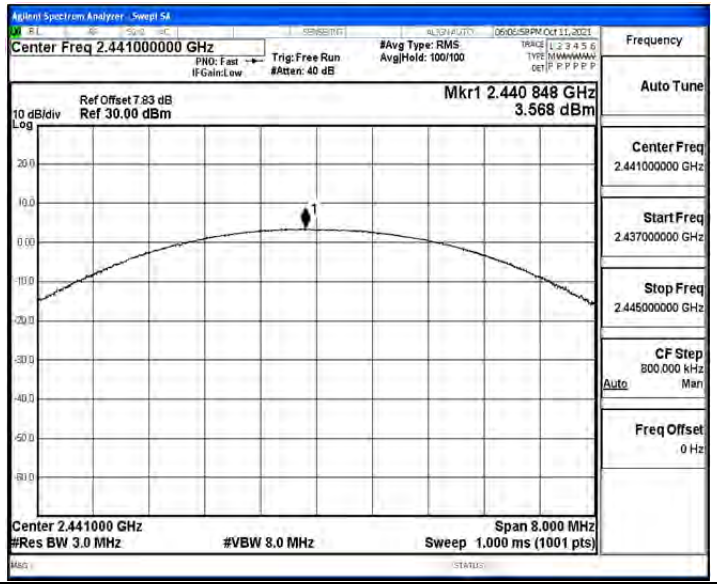
DH5_Ant1_2480



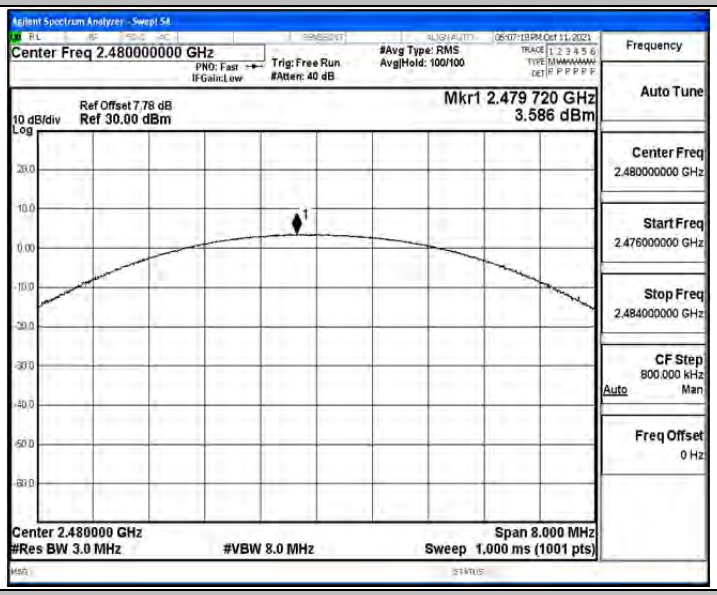
2DH5_Ant1_2402



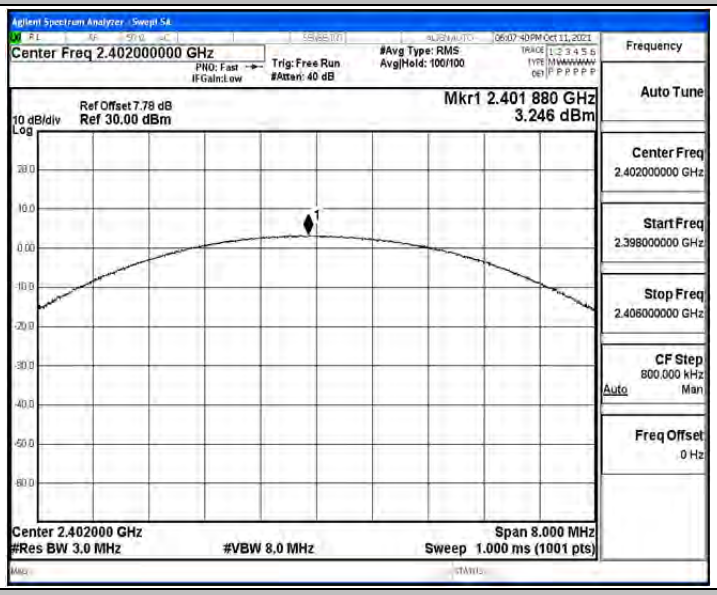
2DH5_Ant1_2441



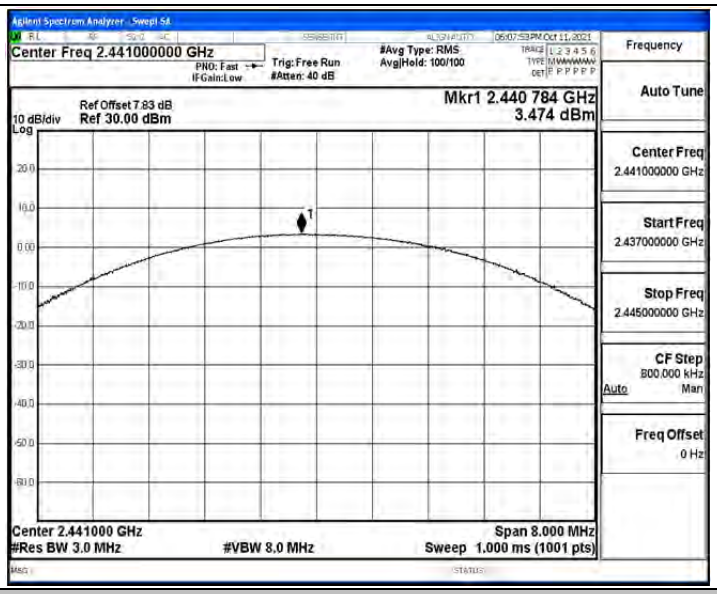
2DH5_Ant1_2480



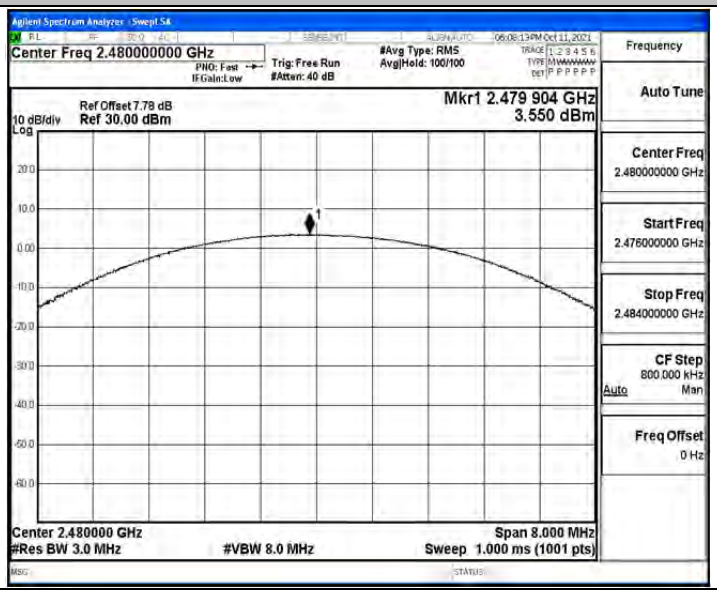
3DH5_Ant1_2402



3DH5_Ant1_2441



3DH5_Ant1_2480



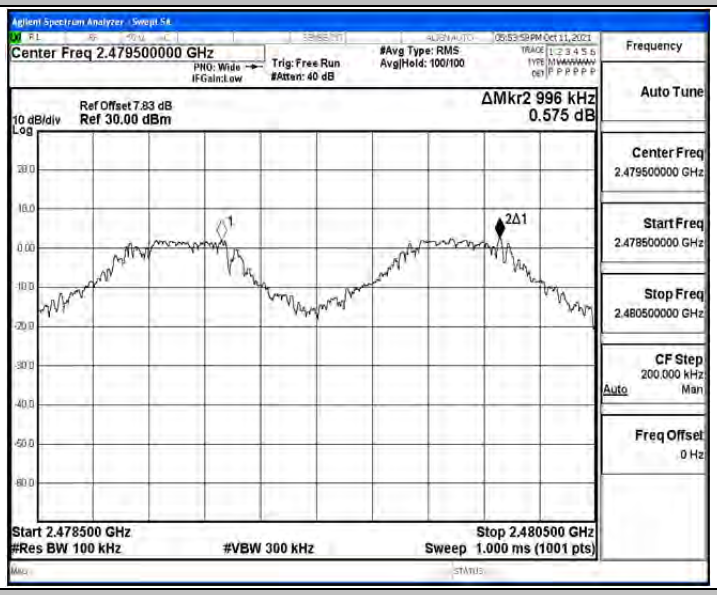
A.3 Carrier frequency separation

Test Result

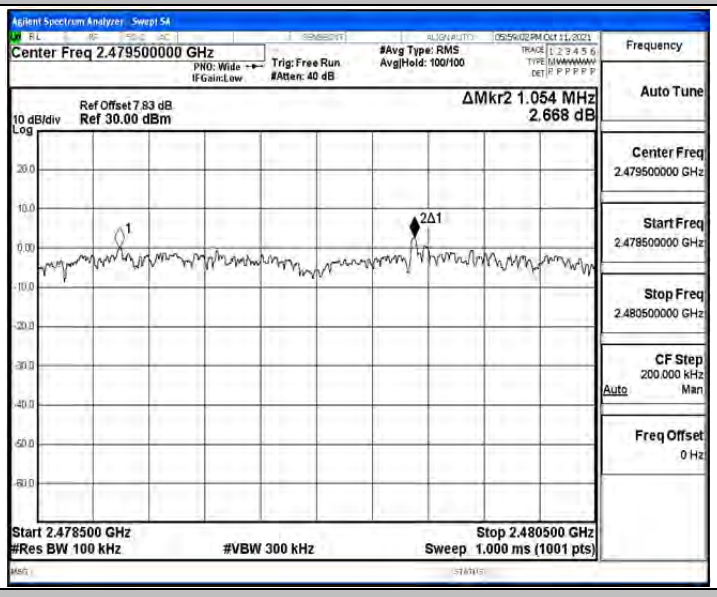
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	Hop	0.996	≥0.951	PASS
2DH5	Ant1	Hop	1.054	≥0.906	PASS
3DH5	Ant1	Hop	1.238	≥0.916	PASS

Test Graphs

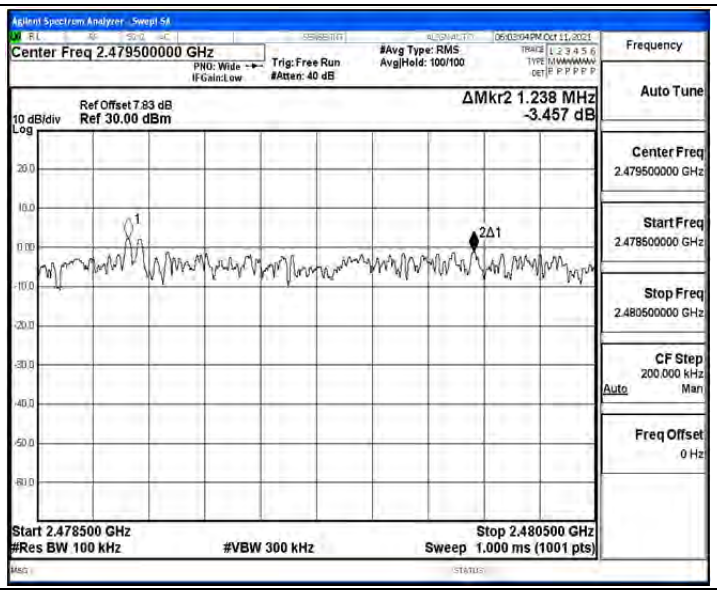
DH5_Ant1_Hop



2DH5_Ant1_Hop



3DH5_Ant1_Hop

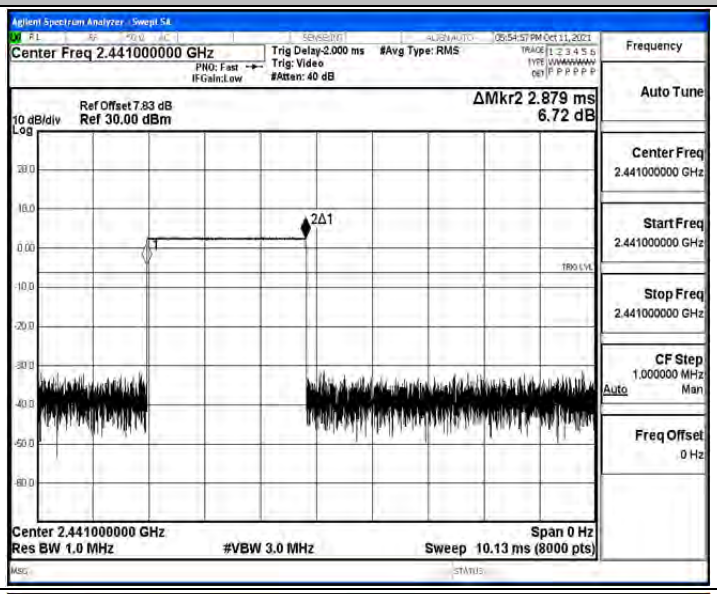
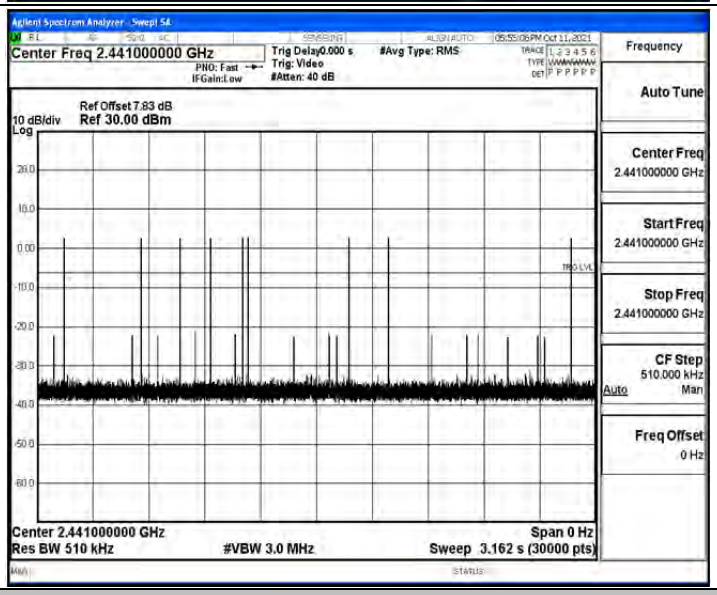

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.479500000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 100/100
Frequency
Auto Tune
Ref Offset 7.83 dB
10 dB/div Ref 30.00 dBm
Log
ΔMkr2 1.238 MHz
-3.457 dB
Center Freq
2.479500000 GHz
Start Freq
2.478500000 GHz
Stop Freq
2.480500000 GHz
CF Step
200.000 kHz
Auto Man
Freq Offset
0 Hz
Start 2.478500 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.480500 GHz
Sweep 1.000 ms (1001 pts)

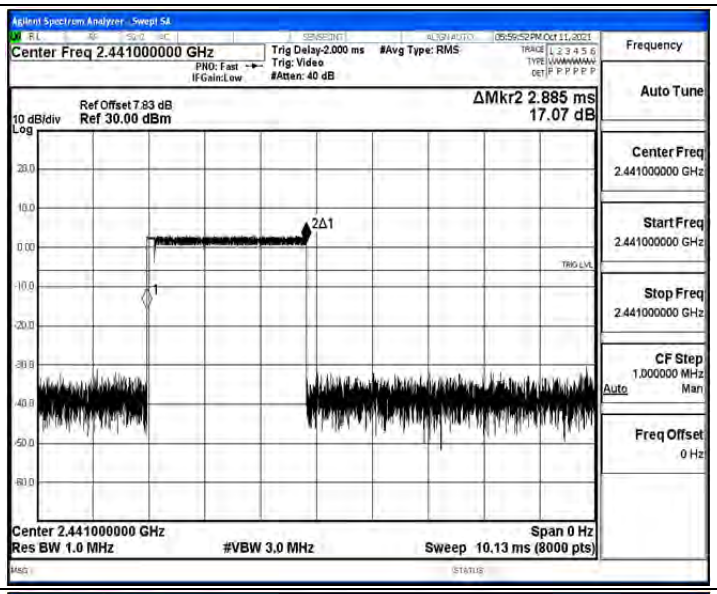
A.4 Time of occupancy

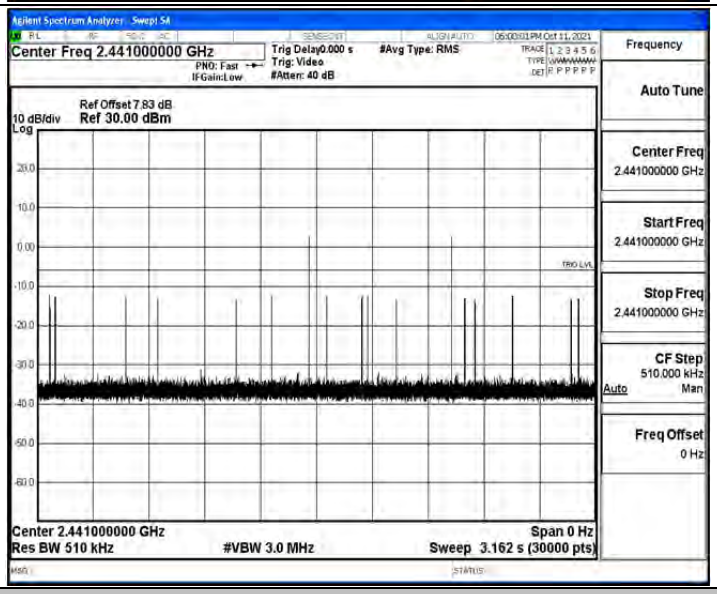
Test Result

TestMode	Antenna	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH5	Ant1	Hop	2.88	100	0.288	≤0.4	PASS
2DH5	Ant1	Hop	2.89	30	0.087	≤0.4	PASS
3DH5	Ant1	Hop	2.89	60	0.173	≤0.4	PASS

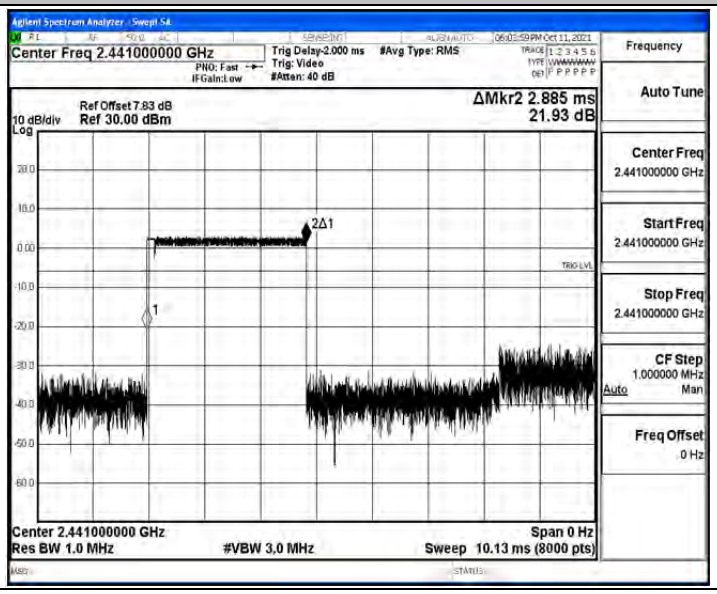
Test Graphs

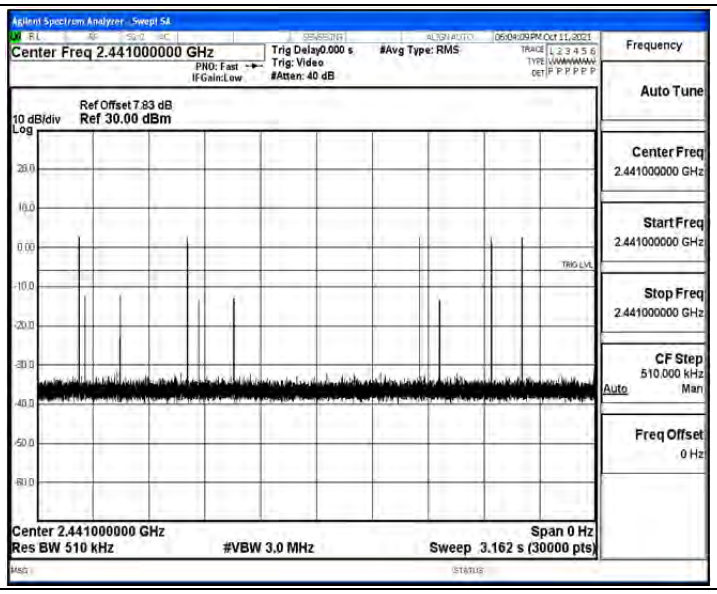
DH5_Ant1_Hop


2DH5_Ant1_Hop





3DH5_Ant1_Hop



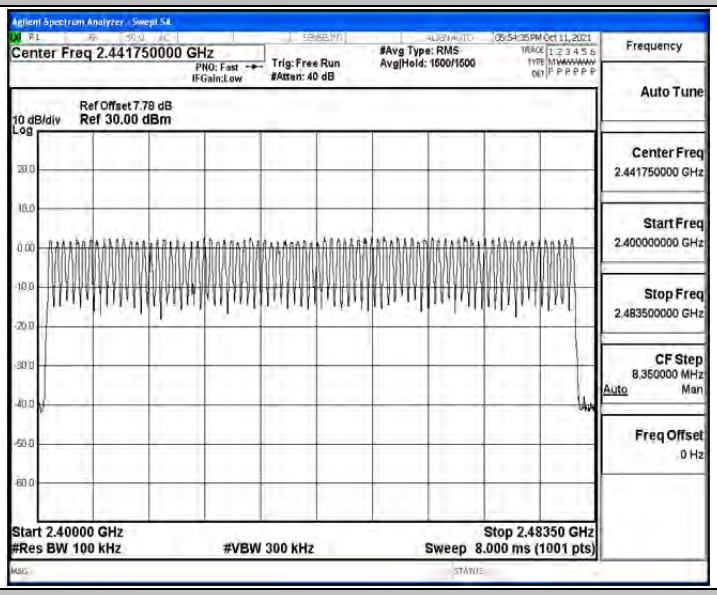
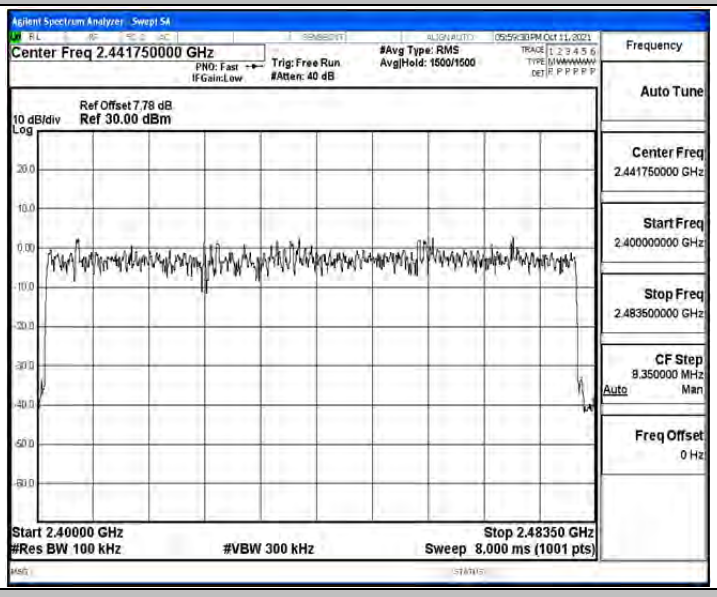

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.441000000 GHz
PNO: Fast
IFGain:Low
Trig Delay0.000 s
Trig: Video
#Atten: 40 dB
#Avg Type: RMS
Frequency
Auto Tune
Ref Offset 7.83 dB
10 dB/div
Ref 30.00 dBm
Log
Center Freq
2.441000000 GHz
Start Freq
2.441000000 GHz
Stop Freq
2.441000000 GHz
CF Step
510.000 kHz
Auto
Man
Freq Offset
0 Hz
Center 2.441000000 GHz
Res BW 510 kHz
#VBW 3.0 MHz
Span 0 Hz
Sweep 3.162 s (30000 pts)

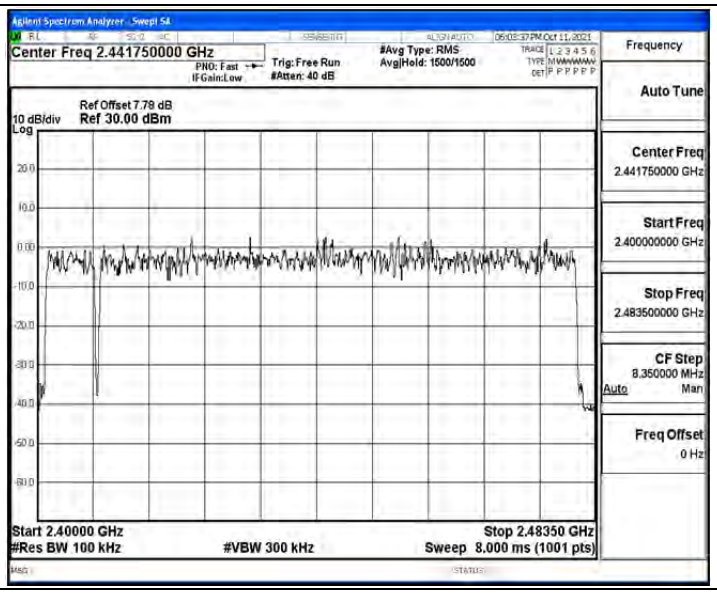
A.5 Number of hopping channels

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


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: 1500/1500
06:03:37 PM Oct 11, 2021
Ref Offset 7.78 dB
10 dB/div
Ref 30.00 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

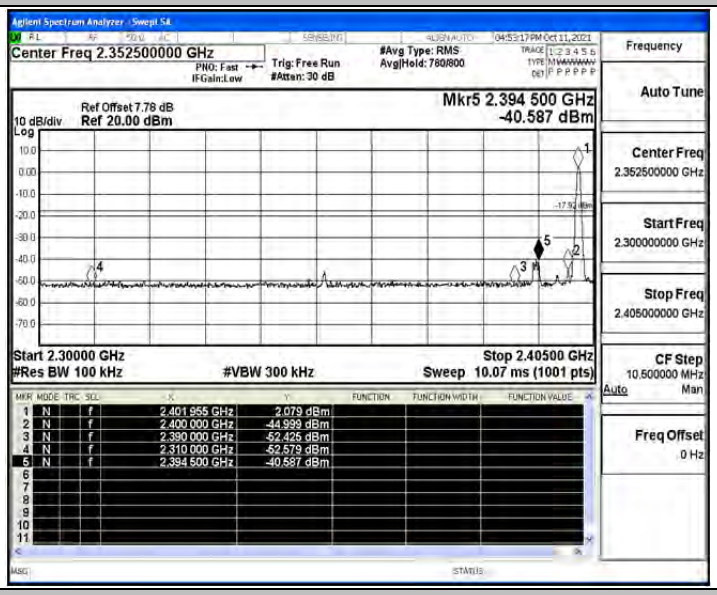
A.6 Band edge measurements

Test Result

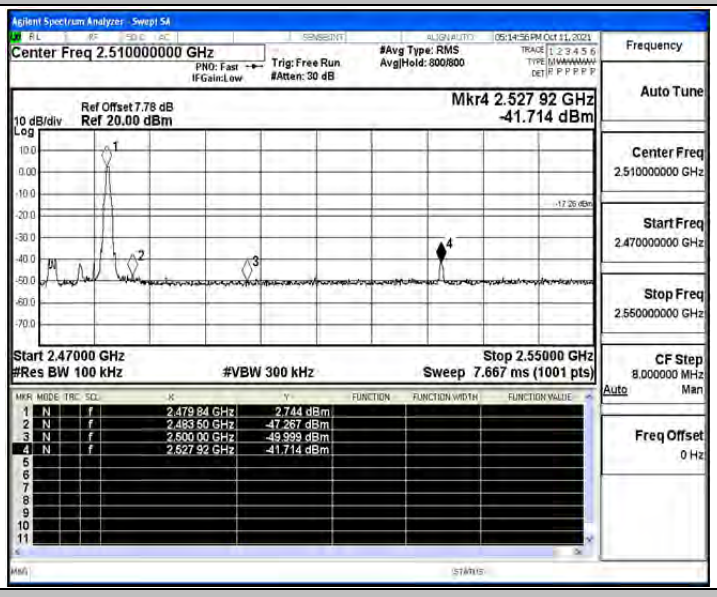
TestMode	Antenna	ChName	Channel	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Low	2402	2.08	-40.59	≤-17.92	PASS
		High	2480	2.74	-41.71	≤-17.26	PASS
		Low	Hop_2402	0.51	-46.14	≤-19.49	PASS
		High	Hop_2480	2.17	-42.73	≤-17.83	PASS
2DH5	Ant1	Low	2402	1.41	-45.11	≤-18.59	PASS
		High	2480	1.78	-43.22	≤-18.22	PASS
		Low	Hop_2402	-0.08	-48.96	≤-20.08	PASS
		High	Hop_2480	2.51	-42.37	≤-17.49	PASS
3DH5	Ant1	Low	2402	2.14	-42.3	≤-17.86	PASS
		High	2480	2.61	-44.4	≤-17.39	PASS
		Low	Hop_2402	-0.95	-47.42	≤-20.95	PASS
		High	Hop_2480	2.72	-43.18	≤-17.28	PASS

Test Graphs

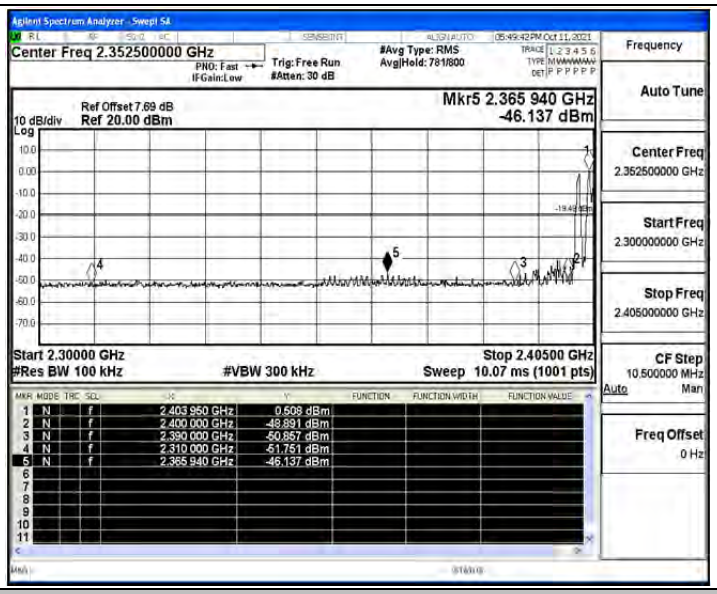
DH5_Ant1_Low_2402



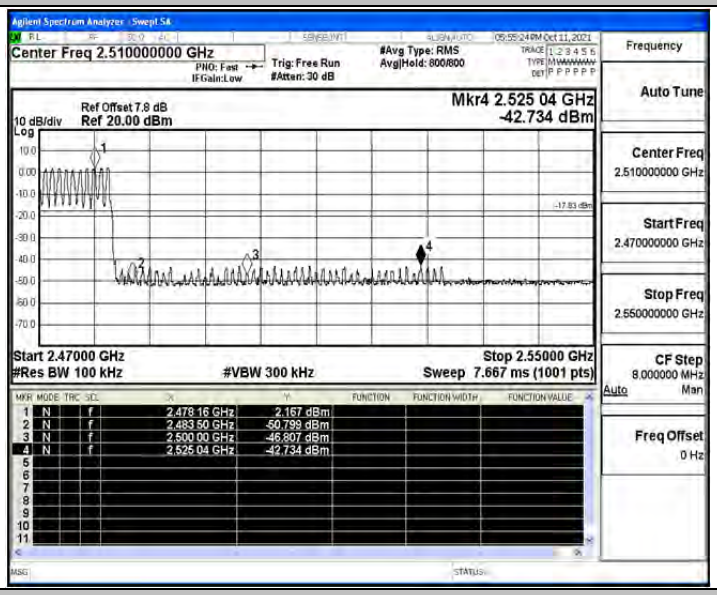
DH5_Ant1_High_2480



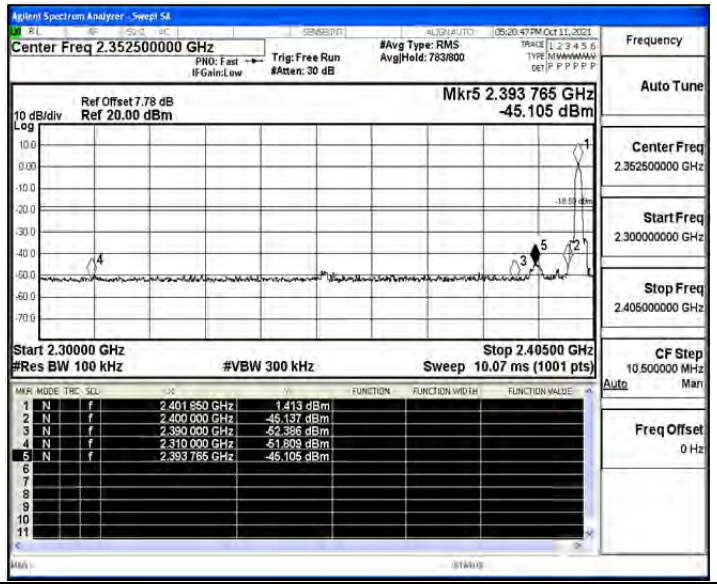
DH5_Ant1_Low_Hop_2402



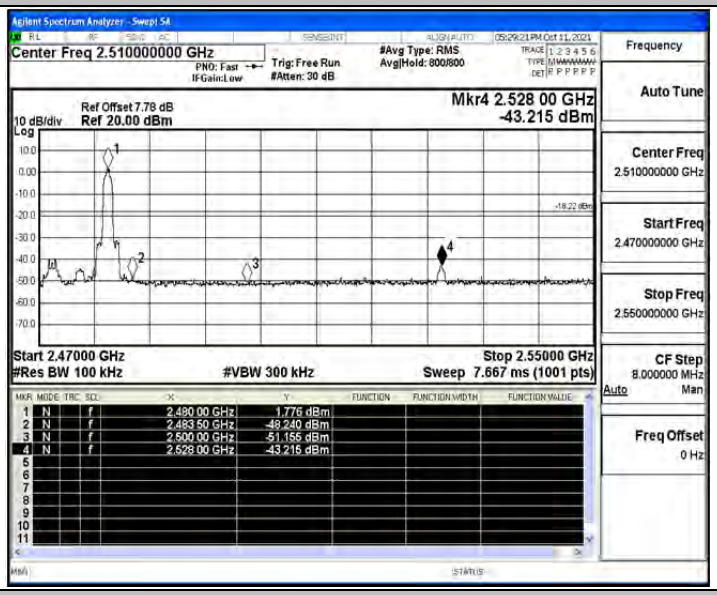
DH5_Ant1_High_Hop_2480



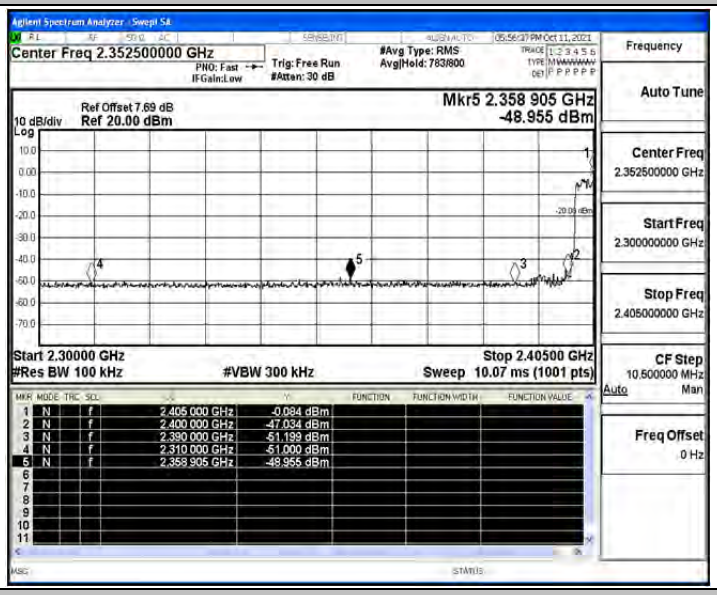
2DH5_Ant1_Low_2402



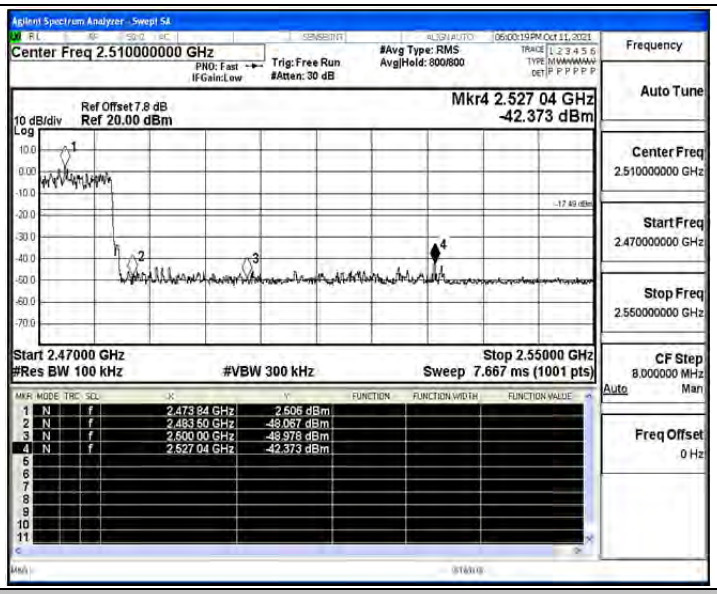
2DH5_Ant1_High_2480



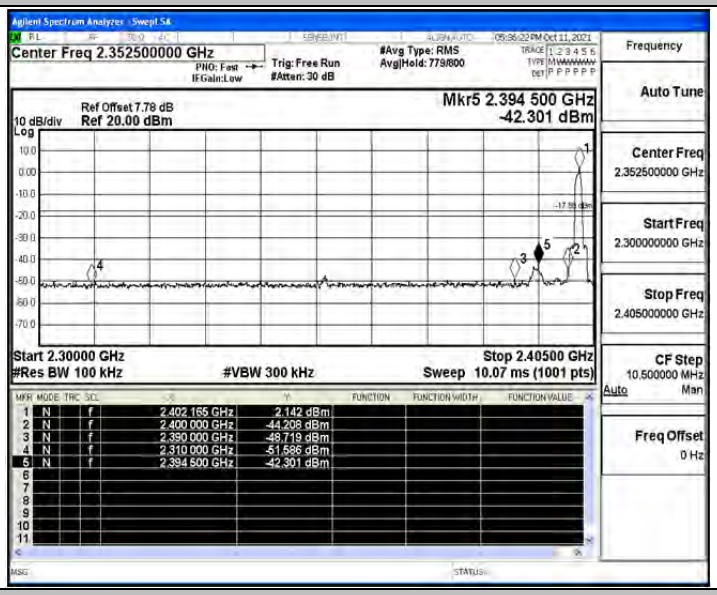
2DH5_Ant1_Low_Hop_2402



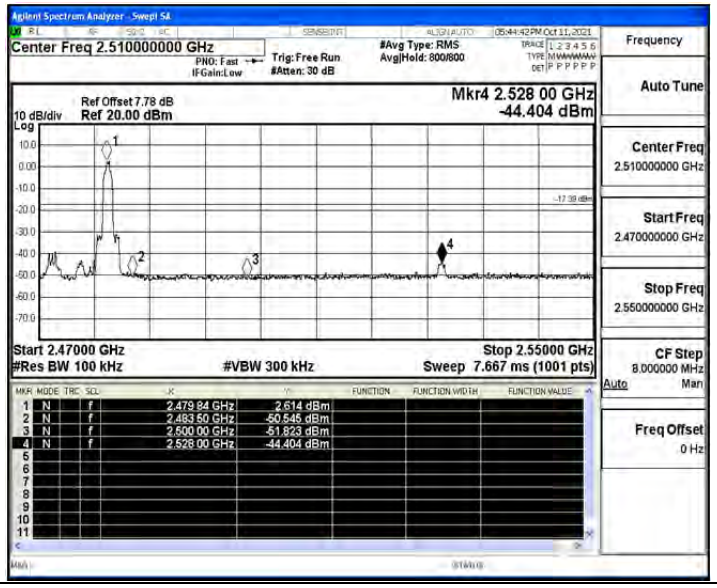
2DH5_Ant1_High_Hop_2480



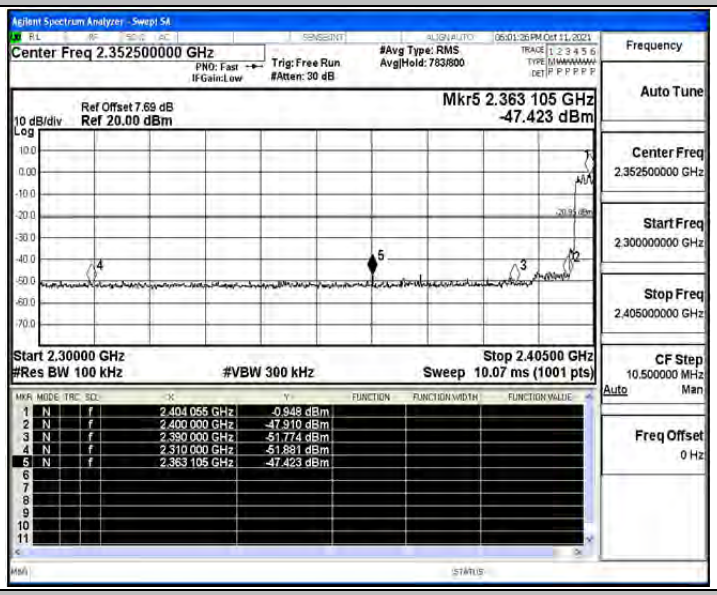
3DH5_Ant1_Low_2402



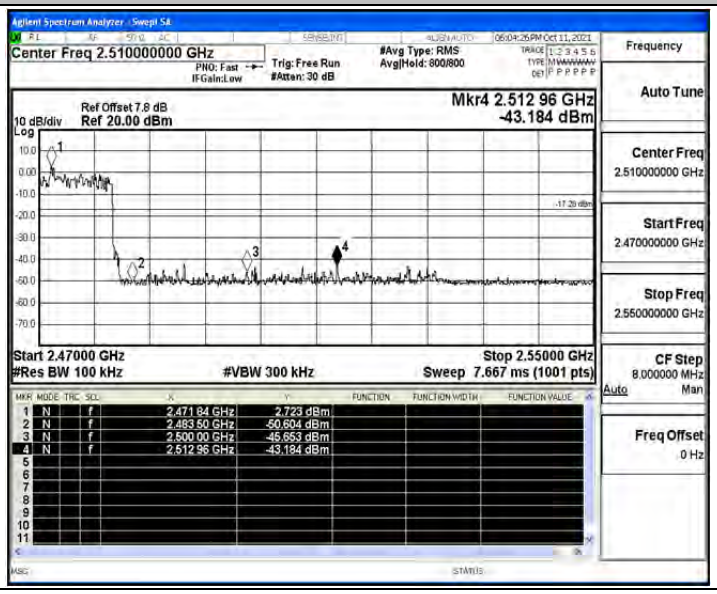
3DH5_Ant1_High_2480



3DH5_Ant1_Low_Hop_2402



3DH5_Ant1_High_Hop_2480



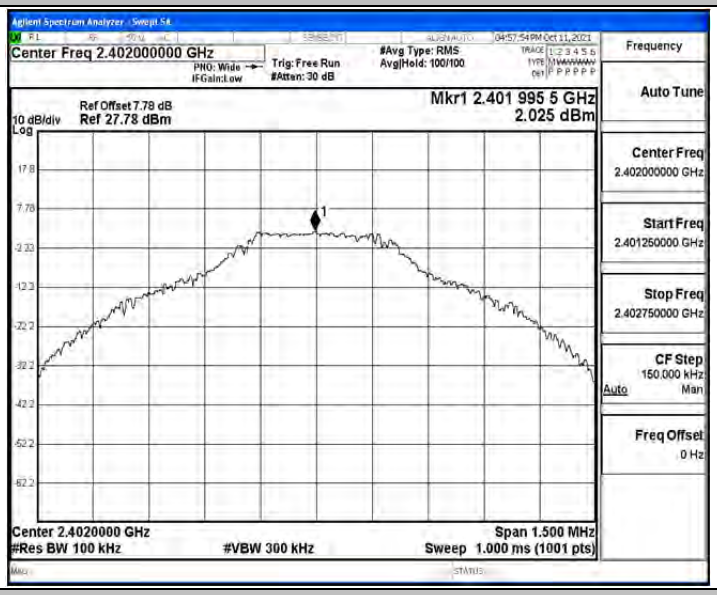
A.7 Conducted Spurious Emission

Test Result

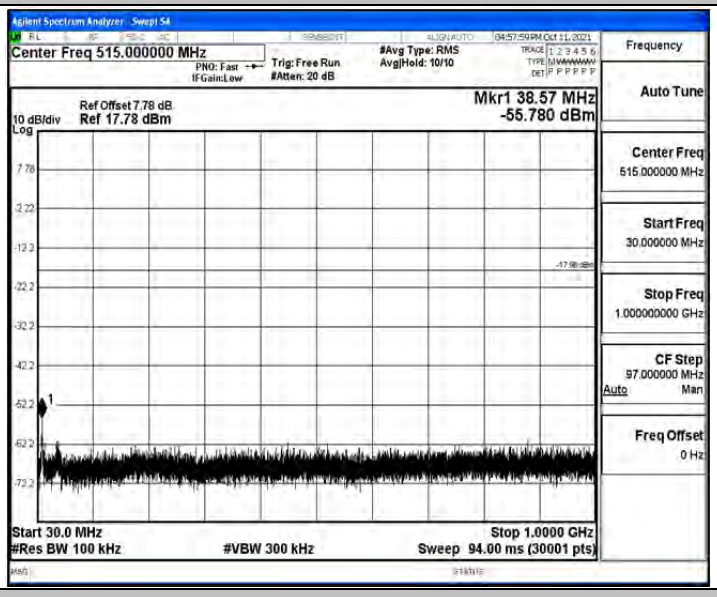
TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	2402	Reference	2.03	2.03	---	PASS
			30~1000	2.03	-55.78	≤-17.98	PASS
			1000~26500	2.03	-38.91	≤-17.98	PASS
		2441	Reference	2.20	2.20	---	PASS
			30~1000	2.20	-55.34	≤-17.8	PASS
			1000~26500	2.20	-40.11	≤-17.8	PASS
		2480	Reference	2.72	2.72	---	PASS
			30~1000	2.72	-54.62	≤-17.28	PASS
			1000~26500	2.72	-40.57	≤-17.28	PASS
2DH5	Ant1	2402	Reference	2.13	2.13	---	PASS
			30~1000	2.13	-54.42	≤-17.87	PASS
			1000~26500	2.13	-40.98	≤-17.87	PASS
		2441	Reference	0.01	0.01	---	PASS
			30~1000	0.01	-28.52	≤-19.99	PASS
			1000~26500	0.01	-43.92	≤-19.99	PASS
		2480	Reference	2.01	2.01	---	PASS
			30~1000	2.01	-55.45	≤-18	PASS
			1000~26500	2.01	-43.79	≤-18	PASS
3DH5	Ant1	2402	Reference	1.02	1.02	---	PASS
			30~1000	1.02	-55.4	≤-18.98	PASS
			1000~26500	1.02	-43	≤-18.98	PASS
		2441	Reference	1.66	1.66	---	PASS
			30~1000	1.66	-54.77	≤-18.34	PASS
			1000~26500	1.66	-41.89	≤-18.34	PASS
		2480	Reference	2.27	2.27	---	PASS
			30~1000	2.27	-55.56	≤-17.73	PASS
			1000~26500	2.27	-38.95	≤-17.73	PASS

Test Graphs

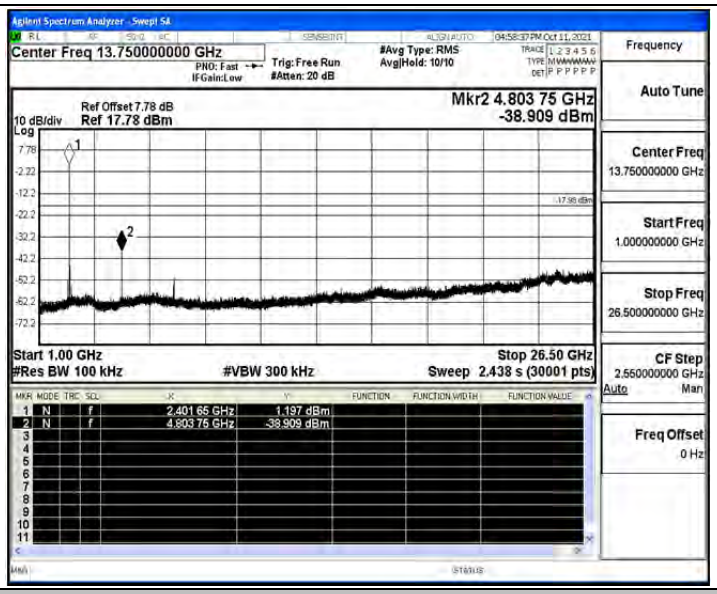
DH5_Ant1_2402_0~Reference



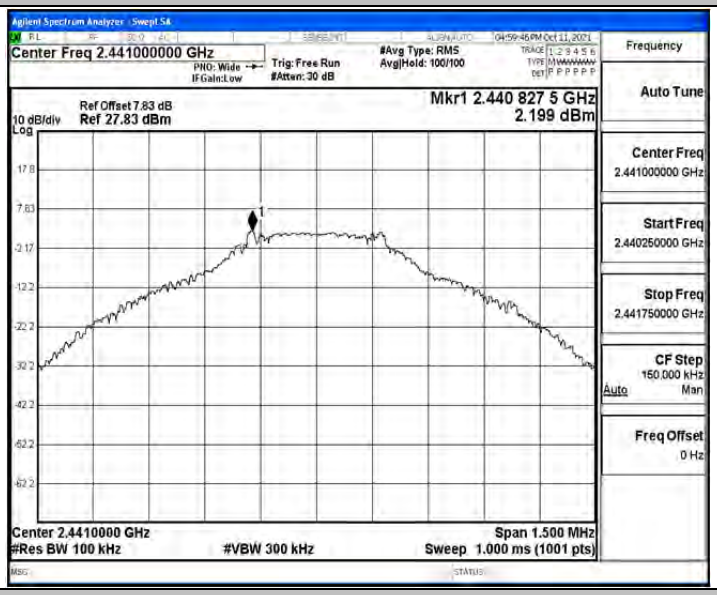
DH5_Ant1_2402_30~1000



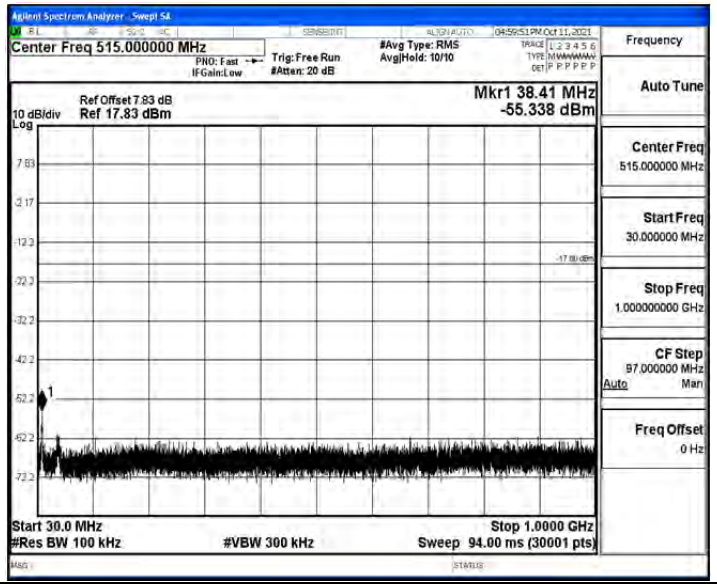
DH5_Ant1_2402_1000~26500



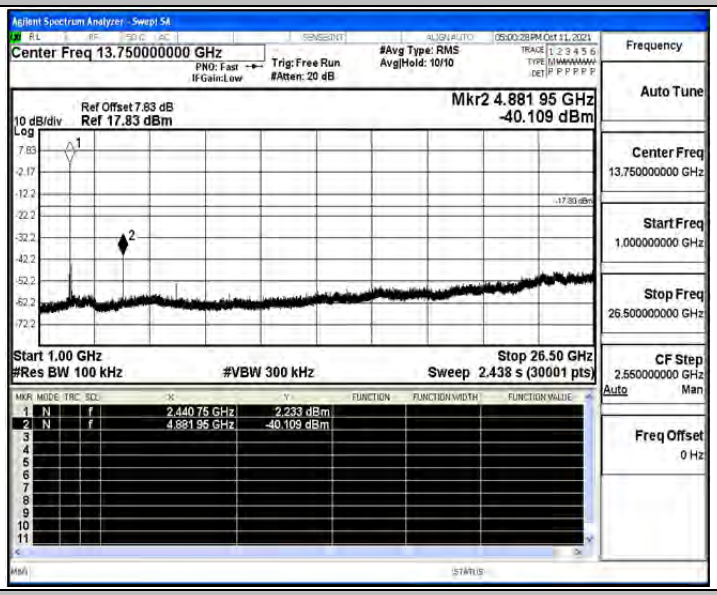
DH5_Ant1_2441_0~Reference



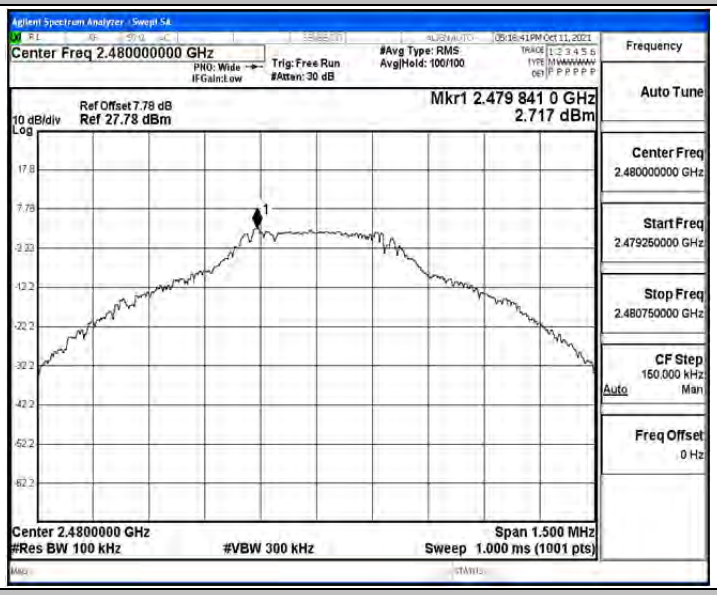
DH5_Ant1_2441_30~1000



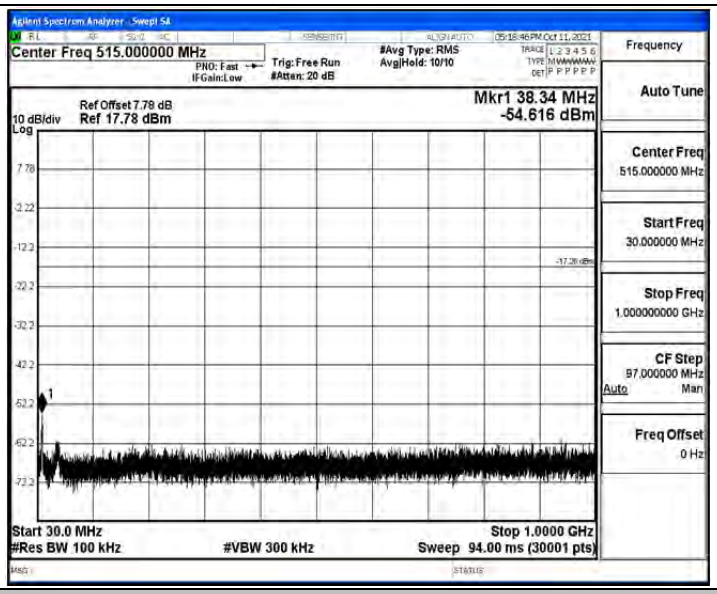
DH5_Ant1_2441_1000~26500



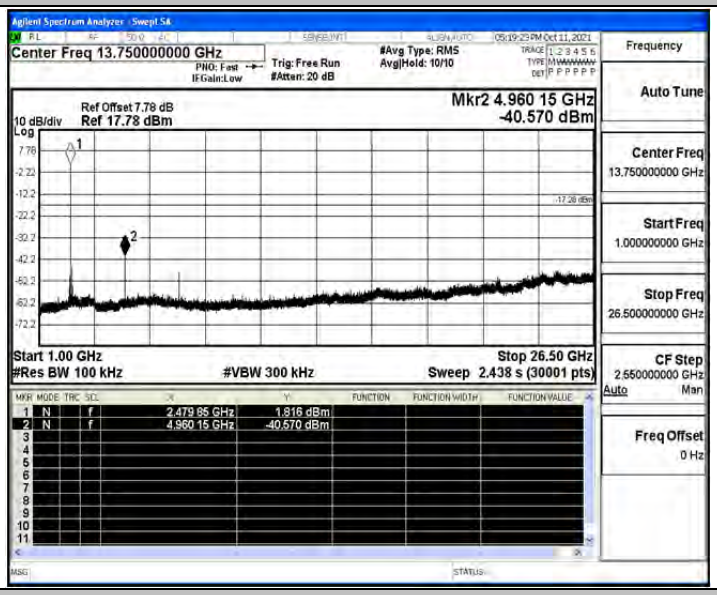
DH5_Ant1_2480_0~Reference



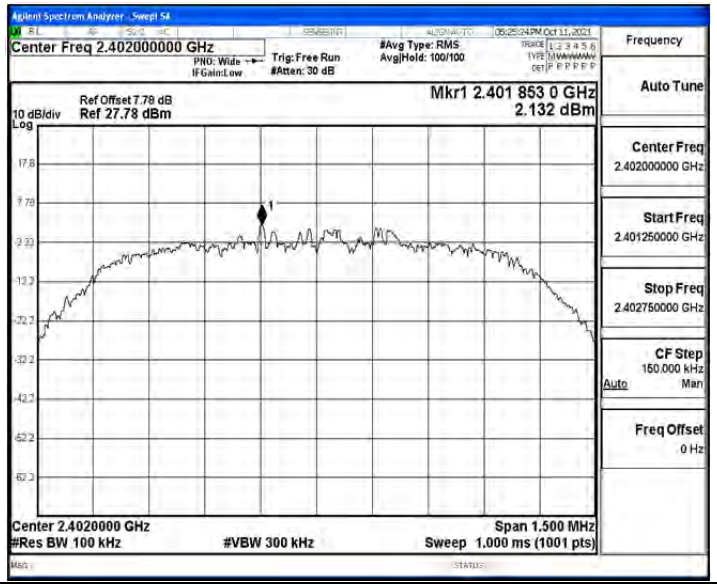
DH5_Ant1_2480_30~1000



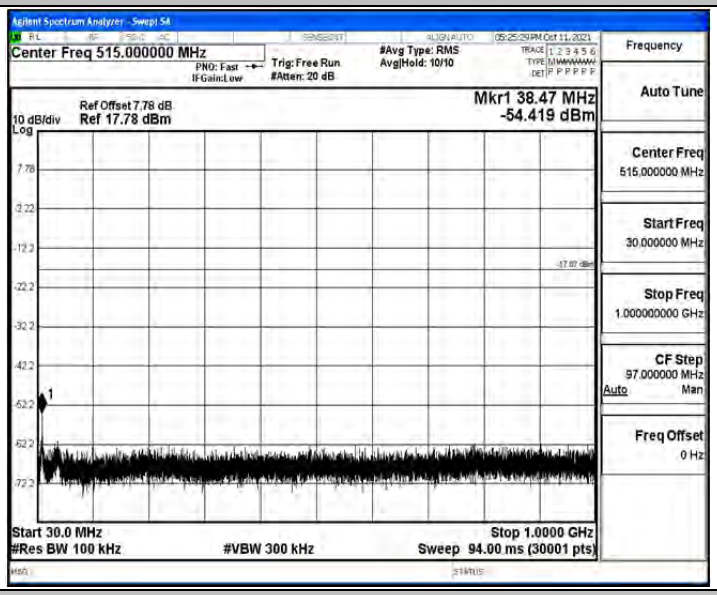
DH5_Ant1_2480_1000~26500



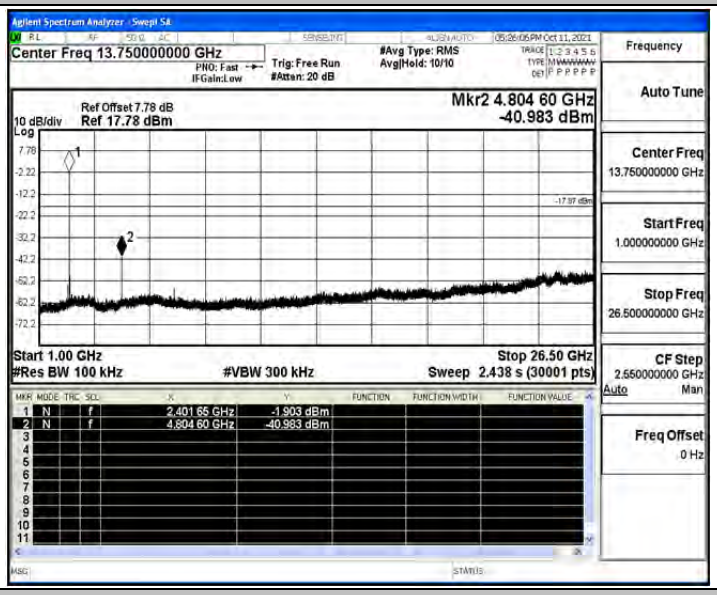
2DH5_Ant1_2402_0~Reference



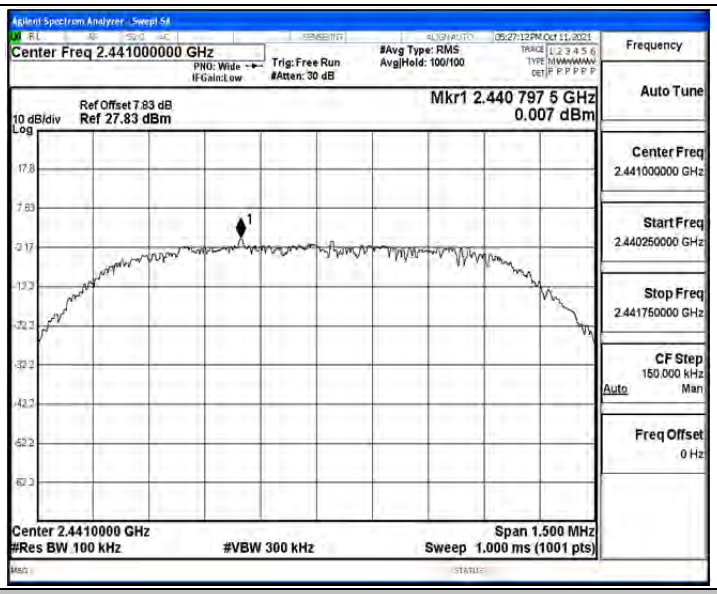
2DH5_Ant1_2402_30~1000



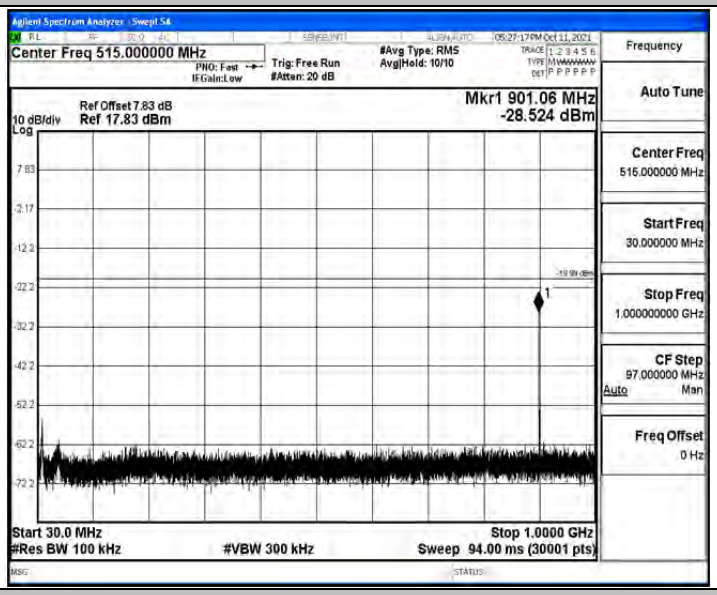
2DH5_Ant1_2402_1000~26500



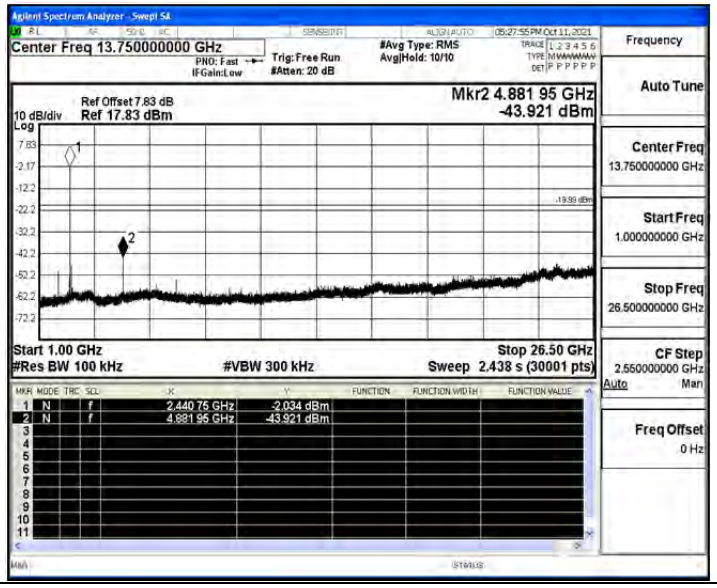
2DH5_Ant1_2441_0~Reference



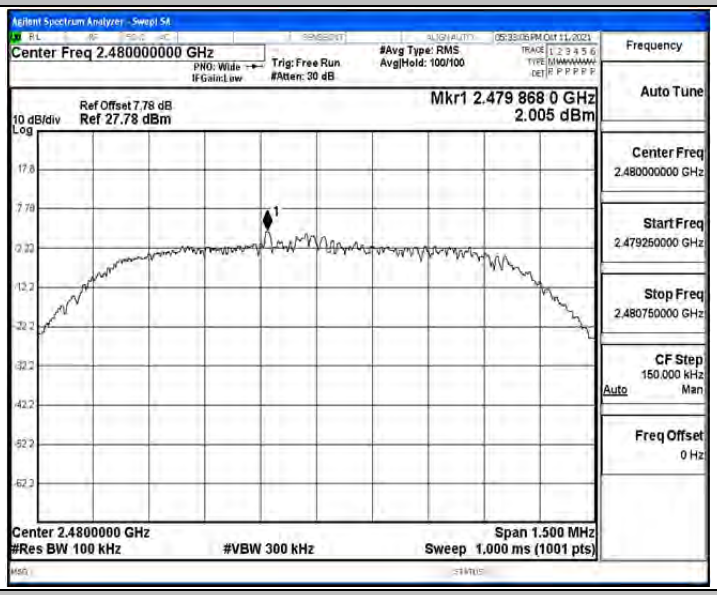
2DH5_Ant1_2441_30~1000



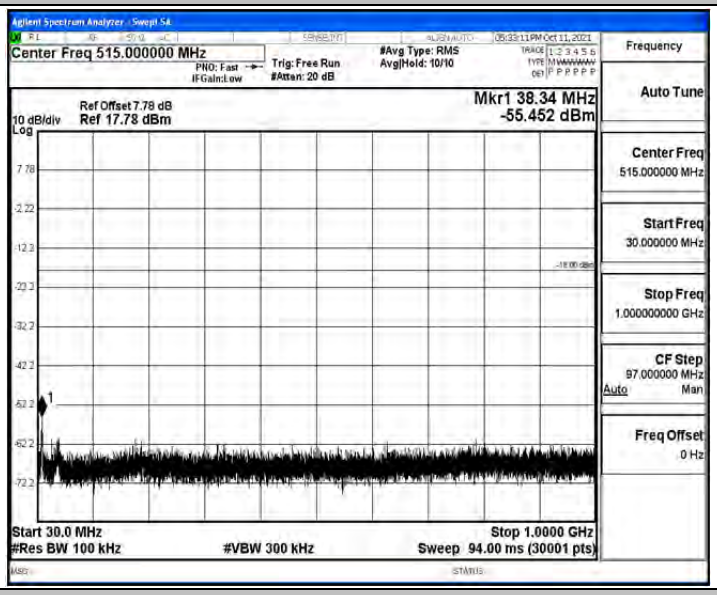
2DH5_Ant1_2441_1000~26500



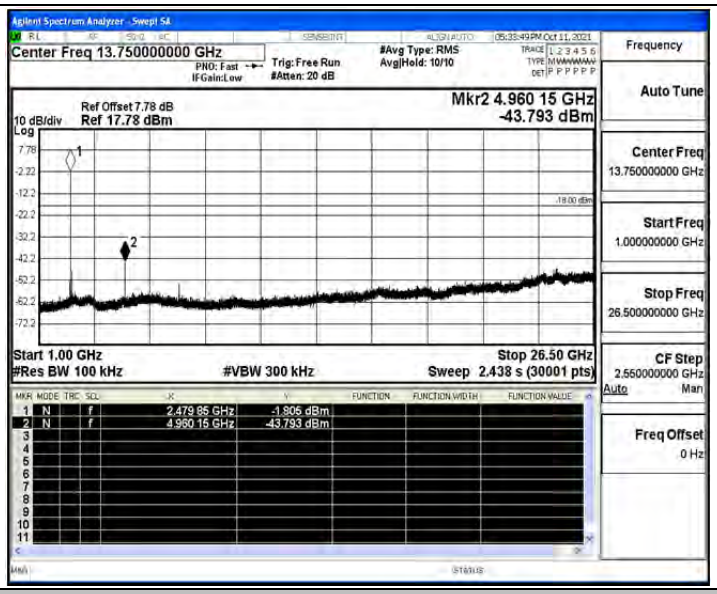
2DH5_Ant1_2480_0~Reference



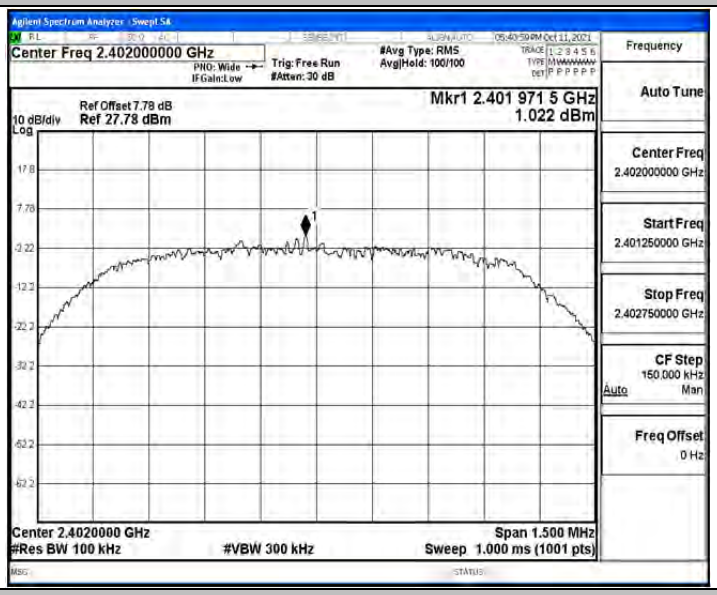
2DH5_Ant1_2480_30~1000



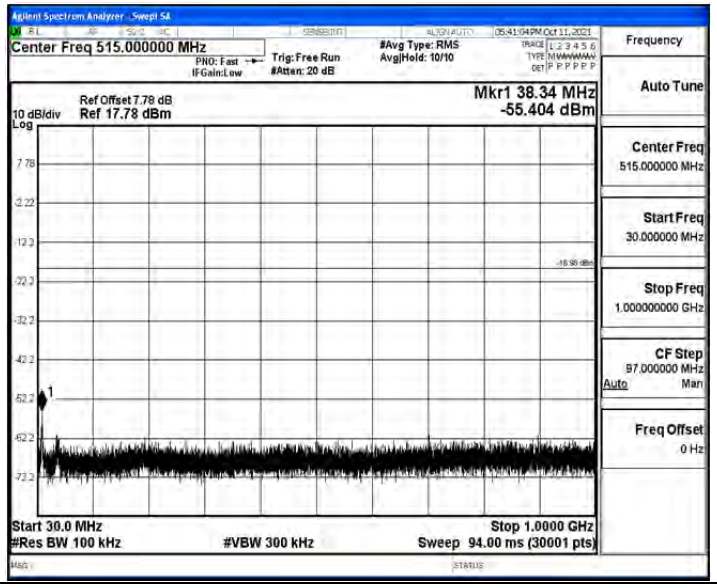
2DH5_Ant1_2480_1000~26500



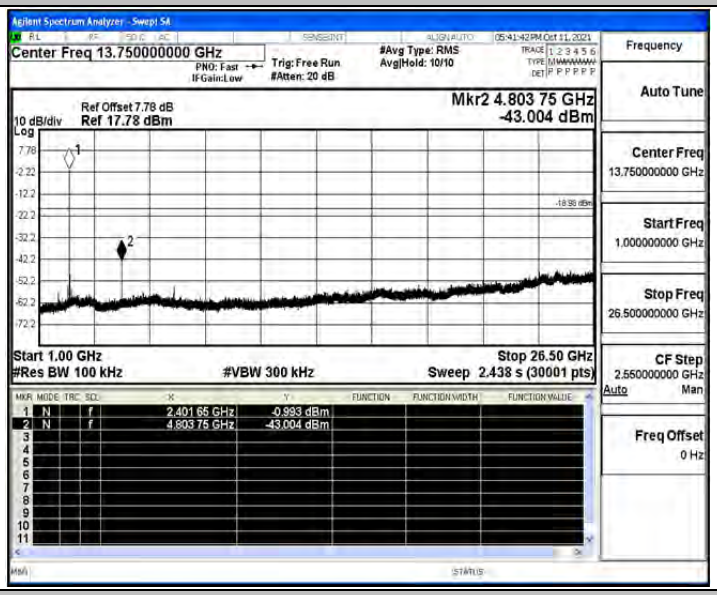
3DH5_Ant1_2402_0~Reference



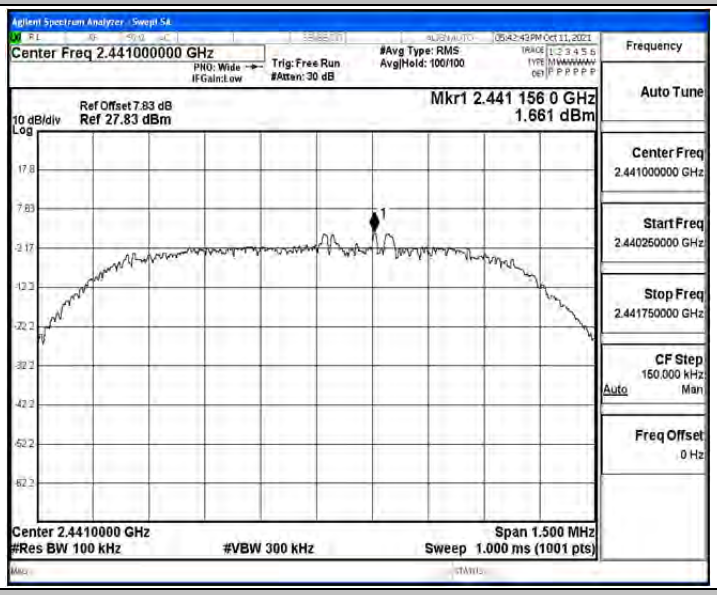
3DH5_Ant1_2402_30~1000



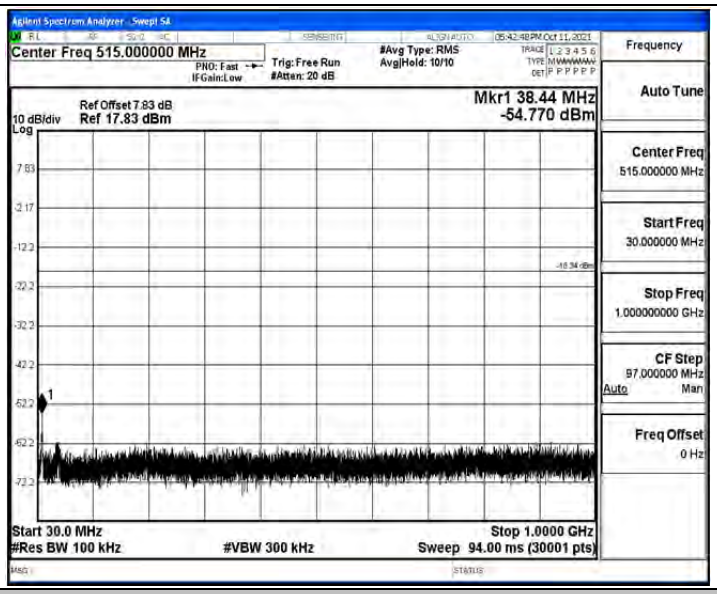
3DH5_Ant1_2402_1000~26500



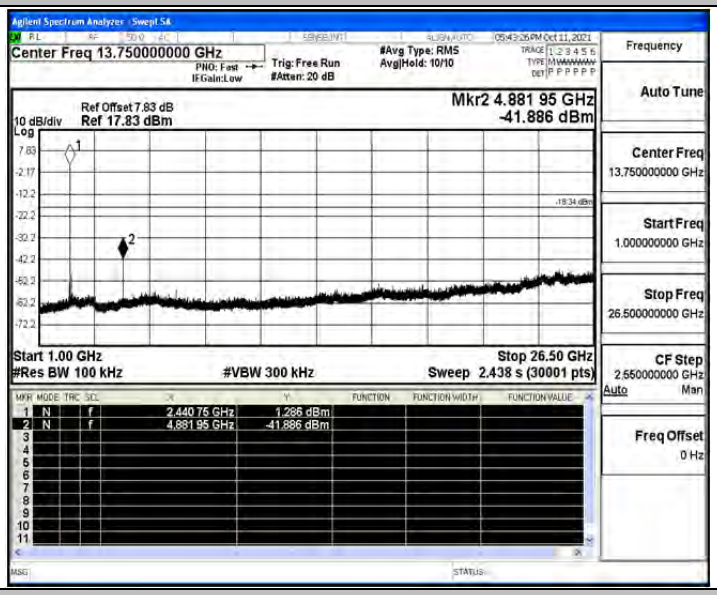
3DH5_Ant1_2441_0~Reference



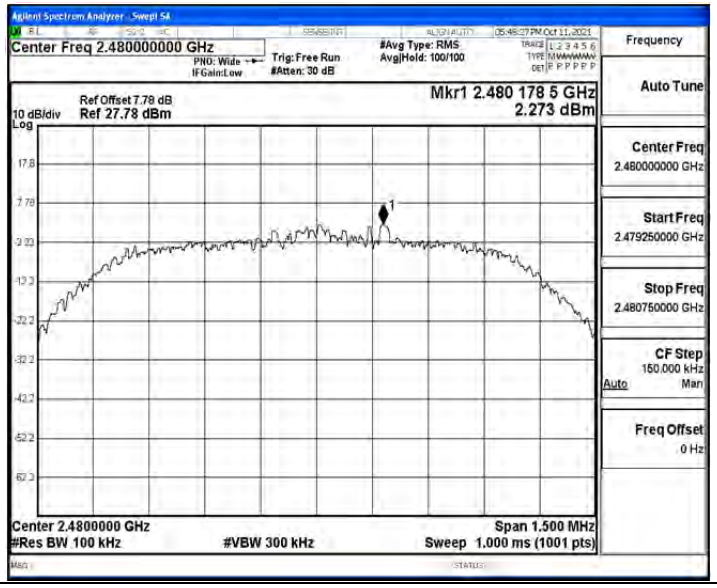
3DH5_Ant1_2441_30~1000



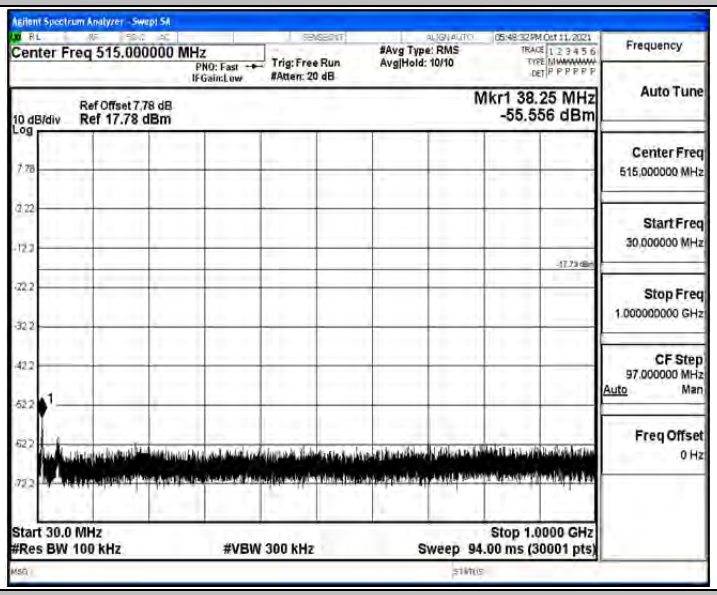
3DH5_Ant1_2441_1000~26500



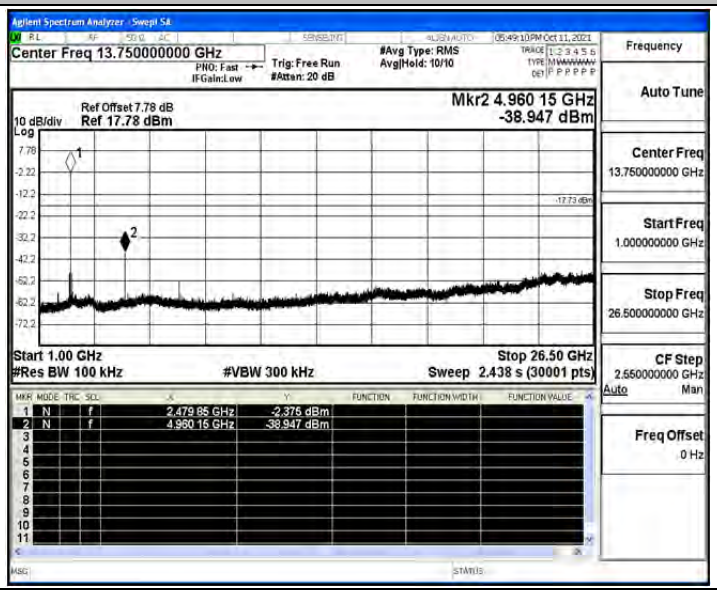
3DH5_Ant1_2480_0~Reference



3DH5_Ant1_2480_30~1000



3DH5_Ant1_2480_1000~26500



A.8 Emissions in Restricted Bands

Test Result

TestMode	Antenna	ChName	Channel	Detector	Freq. [MHz]	Result [dBm]	Limit [dBm]	Result [dBuV/m]	Limit [dBuV/m]	Verdict
DH5	Ant1	Low	2402	AV	2310.000	-48.75	≤-41.20	46.45	≤54	PASS
				AV	2354.075	-45.01	≤-41.20	50.19	≤54	PASS
				AV	2390.000	-48.42	≤-41.20	46.78	≤54	PASS
				Peak	2310.000	-40.46	≤-21.20	54.74	≤74	PASS
				Peak	2341.685	-38	≤-21.20	57.20	≤74	PASS
				Peak	2390.000	-39.04	≤-21.20	56.16	≤74	PASS
		High	2480	AV	2483.500	-45.61	≤-41.20	49.59	≤54	PASS
				AV	2483.520	-45.6	≤-41.20	49.60	≤54	PASS
				AV	2500.000	-47.86	≤-41.20	47.34	≤54	PASS
				Peak	2483.500	-37.51	≤-21.20	57.69	≤74	PASS
				Peak	2483.760	-37.06	≤-21.20	58.14	≤74	PASS
				Peak	2500.000	-39.71	≤-21.20	55.49	≤74	PASS
		Low	Hop_2402	Peak	2310.000	-41.11	≤-21.20	54.09	≤74	PASS
				Peak	2379.590	-37.67	≤-21.20	57.53	≤74	PASS
				Peak	2390.000	-40.51	≤-21.20	54.69	≤74	PASS
		High	Hop_2480	Peak	2483.500	-39.48	≤-21.20	55.72	≤74	PASS
				Peak	2486.720	-35.91	≤-21.20	59.29	≤74	PASS
				Peak	2500.000	-39.22	≤-21.20	55.98	≤74	PASS
2DH5	Ant1	Low	2402	AV	2310.000	-48.74	≤-41.20	46.46	≤54	PASS
				AV	2353.970	-45.68	≤-41.20	49.52	≤54	PASS
				AV	2390.000	-48.33	≤-41.20	46.87	≤54	PASS
				Peak	2310.000	-39.12	≤-21.20	56.08	≤74	PASS
				Peak	2382.845	-38.26	≤-21.20	56.94	≤74	PASS
				Peak	2390.000	-39.67	≤-21.20	55.53	≤74	PASS
		High	2480	AV	2483.500	-45.95	≤-41.20	49.25	≤54	PASS
				AV	2483.520	-45.95	≤-41.20	49.25	≤54	PASS
				AV	2500.000	-47.81	≤-41.20	47.39	≤54	PASS
				Peak	2483.500	-38.6	≤-21.20	56.60	≤74	PASS
				Peak	2484.240	-37.27	≤-21.20	57.93	≤74	PASS
				Peak	2500.000	-39.75	≤-21.20	55.45	≤74	PASS
		Low	Hop_2402	Peak	2310.000	-41.1	≤-21.20	54.10	≤74	PASS
				Peak	2389.145	-37.36	≤-21.20	57.84	≤74	PASS
				Peak	2390.000	-39.97	≤-21.20	55.23	≤74	PASS
		High	Hop_2480	Peak	2483.500	-39.7	≤-21.20	55.50	≤74	PASS
				Peak	2494.080	-36.73	≤-21.20	58.47	≤74	PASS
				Peak	2500.000	-39.88	≤-21.20	55.32	≤74	PASS
3DH5	Ant1	Low	2402	AV	2310.000	-48.64	≤-41.20	46.56	≤54	PASS

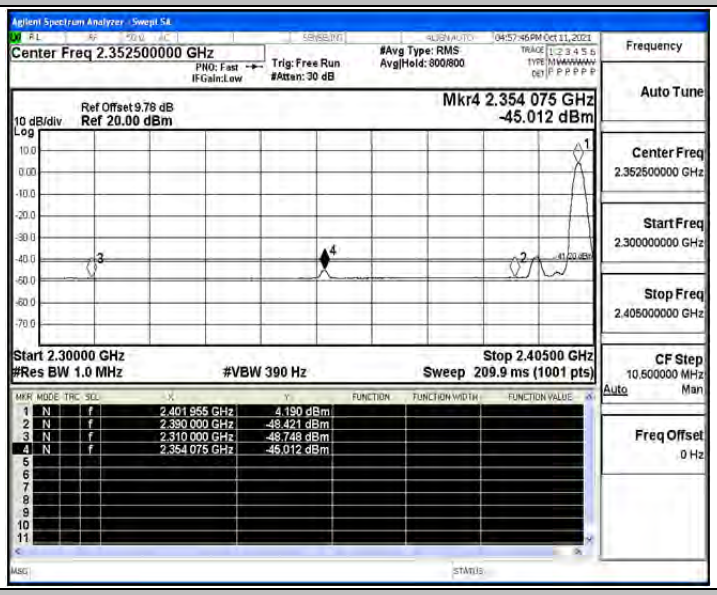
				AV	2354.075	-45.66	≤-41.20	49.54	≤54	PASS
				AV	2390.000	-48.35	≤-41.20	46.85	≤54	PASS
				Peak	2310.000	-40.61	≤-21.20	54.59	≤74	PASS
				Peak	2380.535	-38.03	≤-21.20	57.17	≤74	PASS
				Peak	2390.000	-38.78	≤-21.20	56.42	≤74	PASS
		High	2480	AV	2483.500	-46.11	≤-41.20	49.09	≤54	PASS
				AV	2483.520	-46.11	≤-41.20	49.09	≤54	PASS
				AV	2500.000	-47.9	≤-41.20	47.30	≤54	PASS
				Peak	2483.500	-36.77	≤-21.20	58.43	≤74	PASS
				Peak	2483.840	-36.24	≤-21.20	58.96	≤74	PASS
				Peak	2500.000	-39	≤-21.20	56.20	≤74	PASS
		Low	Hop_2402	Peak	2310.000	-39.92	≤-21.20	55.28	≤74	PASS
				Peak	2355.125	-37.97	≤-21.20	57.23	≤74	PASS
				Peak	2390.000	-40.67	≤-21.20	54.53	≤74	PASS
		High	Hop_2480	Peak	2483.500	-39.96	≤-21.20	55.24	≤74	PASS
				Peak	2494.960	-35.73	≤-21.20	59.47	≤74	PASS
				Peak	2500.000	-38.08	≤-21.20	57.12	≤74	PASS

Note：

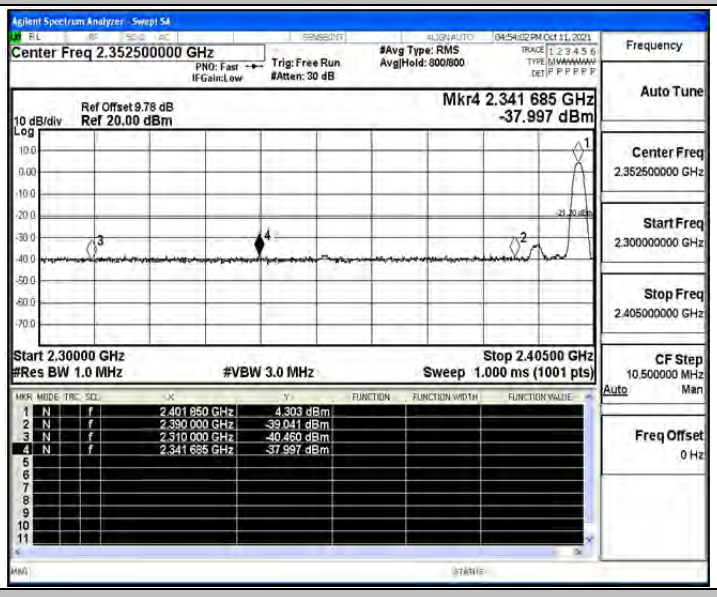
1. The Antenna Gain is compensated in the graph.
2. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

Test Graphs

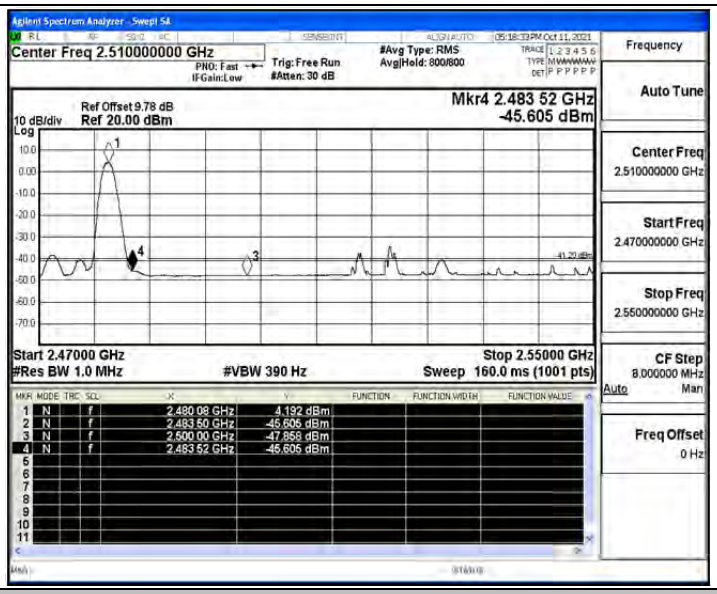
DH5_Ant1_Low_2402_AV



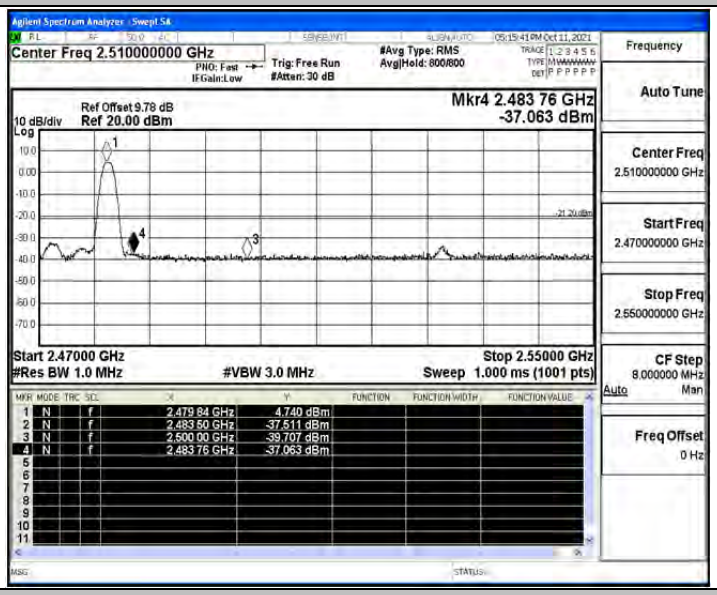
DH5_Ant1_Low_2402_Peak



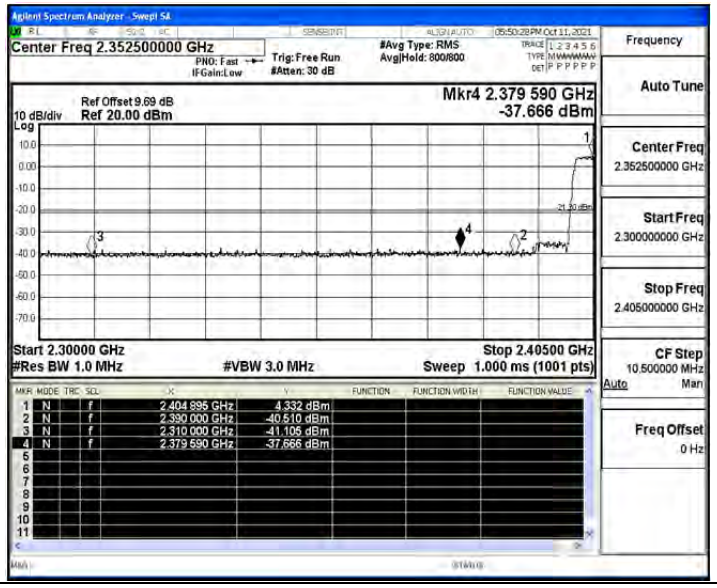
DH5_Ant1_High_2480_AV



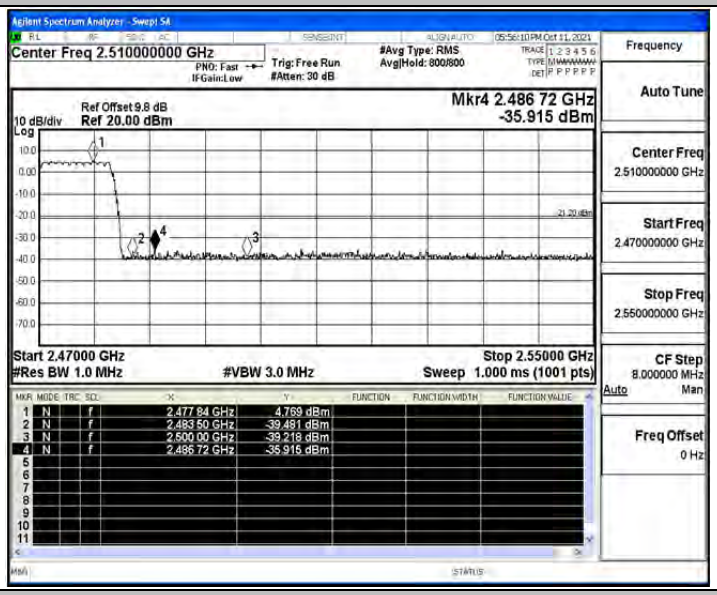
DH5_Ant1_High_2480_Peak



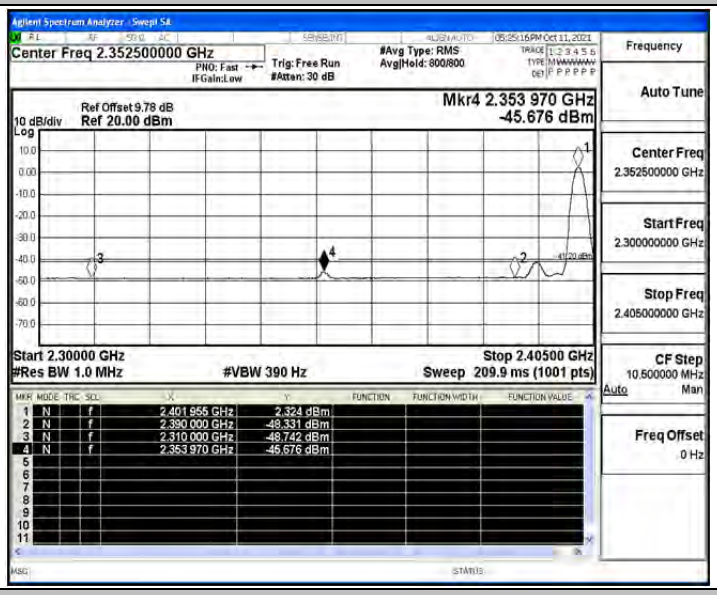
DH5_Ant1_Low_Hop_2402_Peak



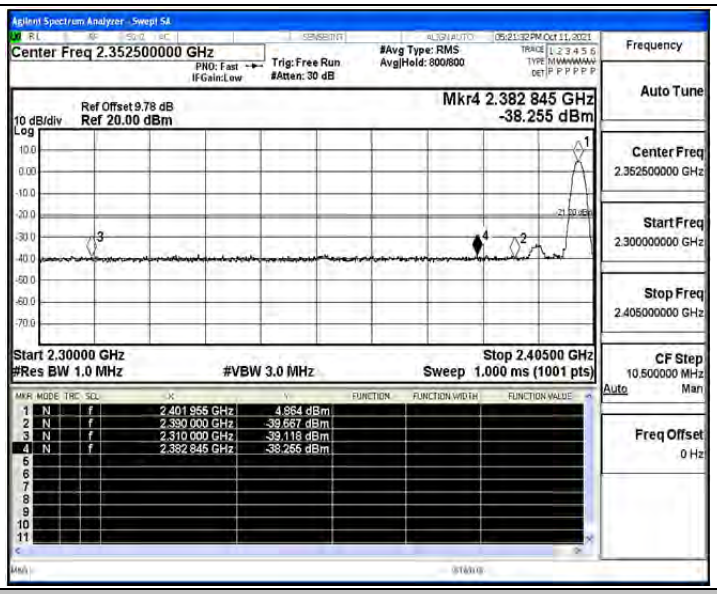
DH5_Ant1_High_Hop_2480_Peak



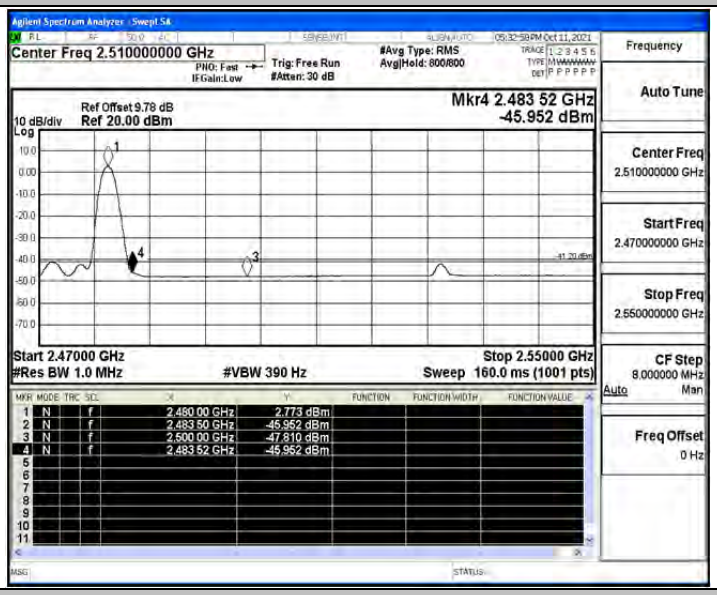
2DH5_Ant1_Low_2402_AV



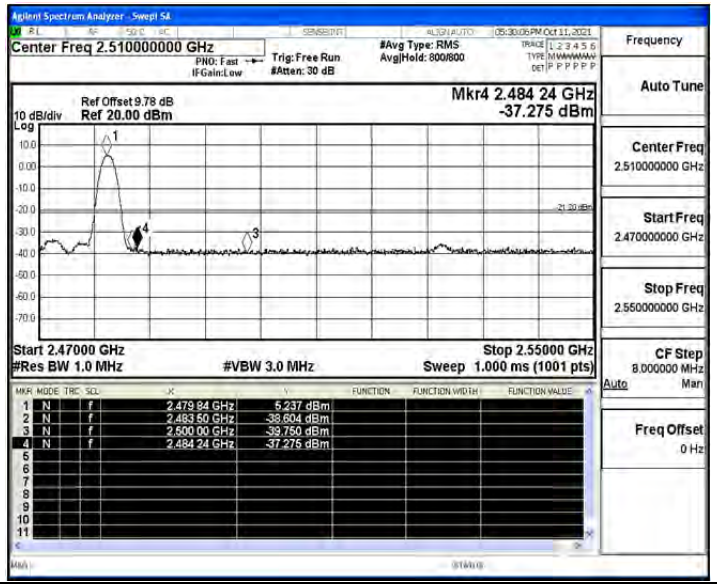
2DH5_Ant1_Low_2402_Peak



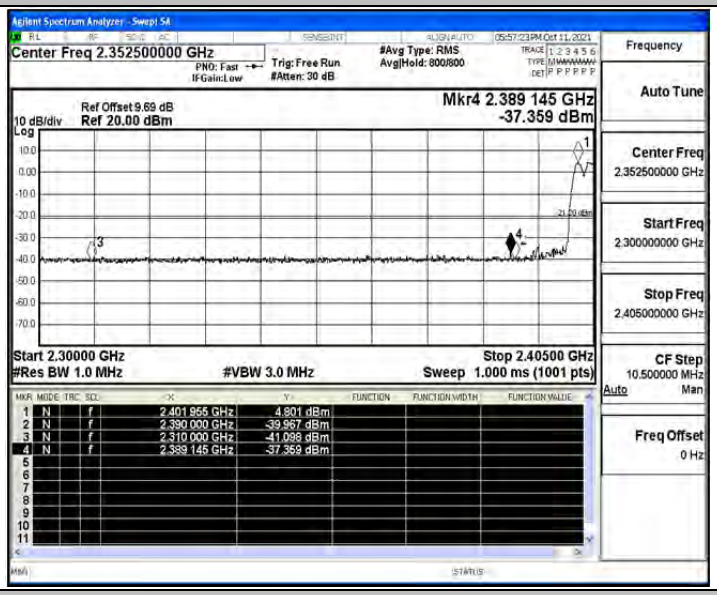
2DH5_Ant1_High_2480_AV



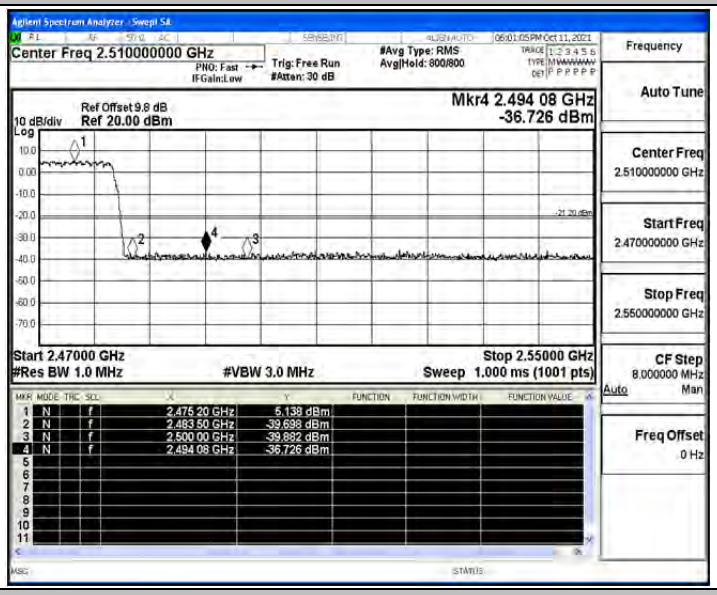
2DH5_Ant1_High_2480_Peak



2DH5_Ant1_Low_Hop_2402_Peak



2DH5_Ant1_High_Hop_2480_Peak



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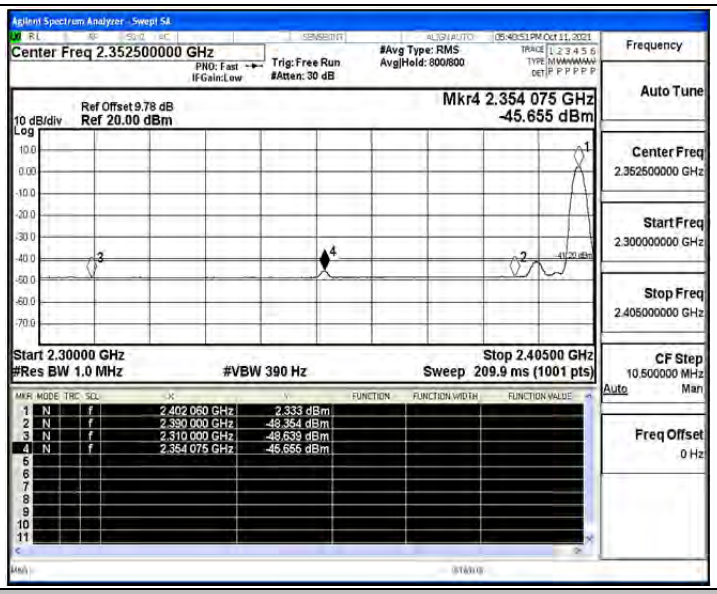

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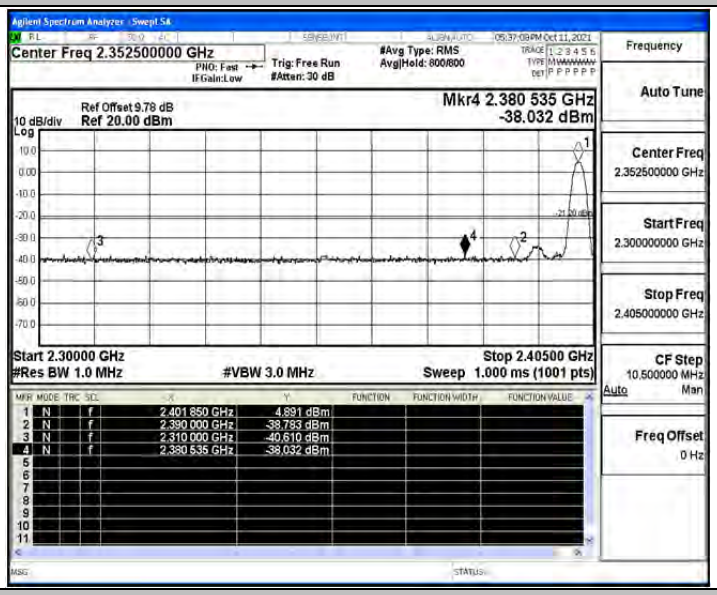

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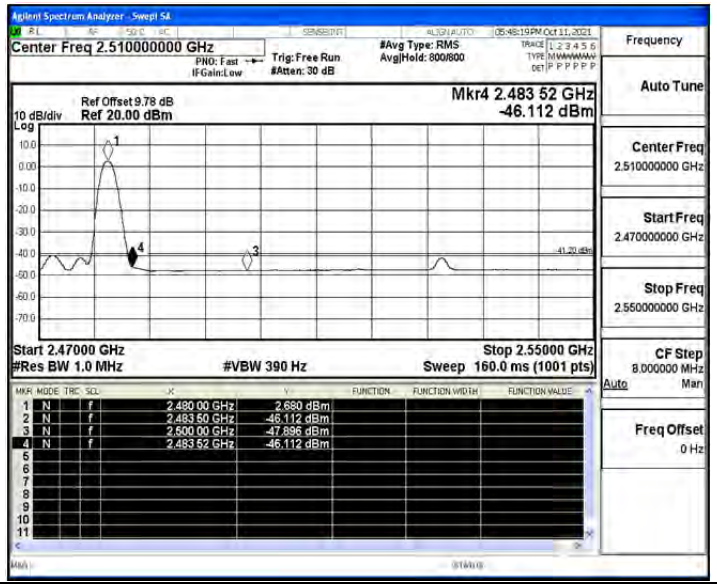

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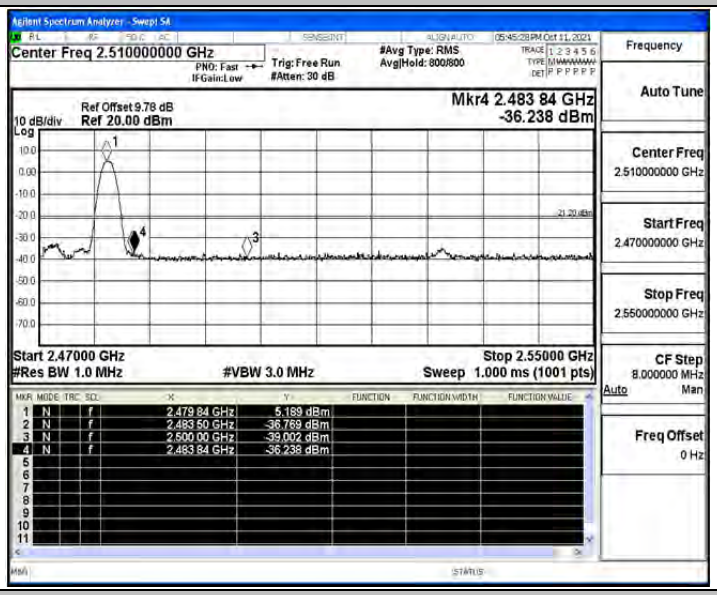
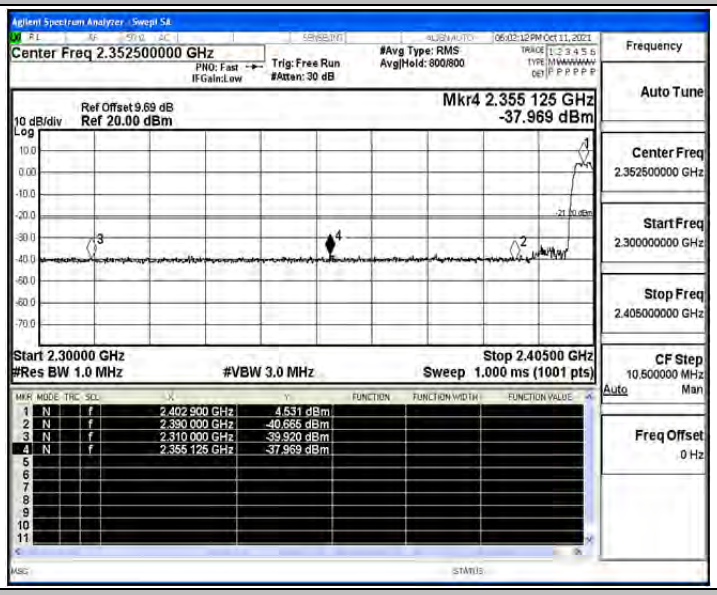
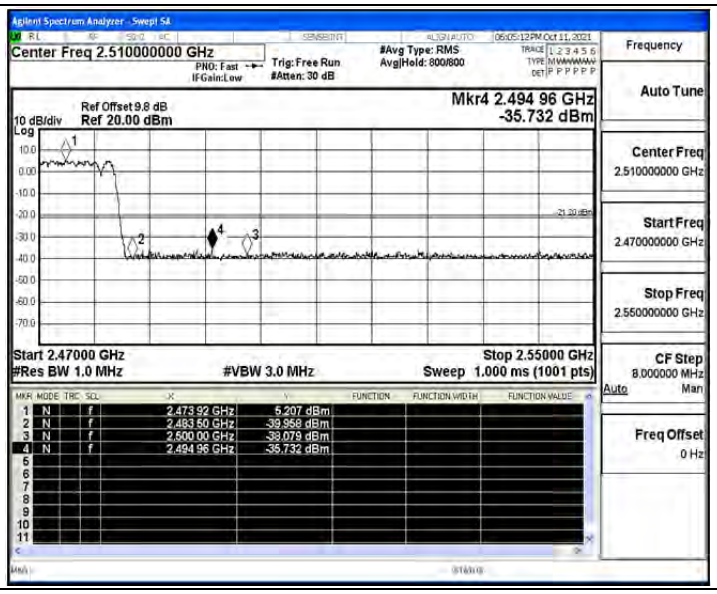


3DH5_Ant1_Low_Hop_2402_Peak



3DH5_Ant1_High_Hop_2480_Peak


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.510000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 800/800
06:05:12 PM Oct 11, 2021
Frequency
Auto Tune
Ref Offset 9.8 dB
10 dB/div Ref 20.00 dBm
Log
Mkr4 2.494 96 GHz
-35.732 dBm
Center Freq
2.510000000 GHz
Start Freq
2.470000000 GHz
Stop Freq
2.550000000 GHz
Start 2.47000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 2.55000 GHz
Sweep 1.000 ms (1001 pts)
CF Step
8.000000 MHz
Auto Man
Freq Offset
0 Hz
1 N f 2.473 92 GHz 5.207 dBm
2 N f 2.483 50 GHz -39.958 dBm
3 N f 2.500 00 GHz -39.079 dBm
4 N f 2.494 96 GHz -35.732 dBm